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Universities as Drivers of Social Innovation and Circular Economy: Insights from the University of Trieste

Universities are main actors capable of fostering social innovation (SI) and advancing circular economy (CE) practices through education, research, community engagement, and internal governance practices. This article examines the University of Trieste (UNITS) as a case study to explore how universities can promote synergies between SI and CE. By analysing in-depth secondary and primary data, our study maps the activities implemented by the University to spread the two paradigms by specifically organizing them in four fields: teaching and student engagement; research and knowledge transfer; third mission and societal outreach; and sustainability practices. Through this mapping activity, this study identifies five benchmark activities that are considered highly impactful in spreading both SI and CE paradigms: the PhD Program in Circular Economy, the RUS Food Working Group, the ARETS water project, the adaptive reuse of the Ex-Ospedale Militare, and the Innovators Community Lab. Our results provide food for thought for policy makers and practitioners, showing some activities that might be replicable among higher education institutions worldwide.

Keywords: university, social innovation, circular economy, sustainability, higher education

Univerze kot gonilniki družbenih inovacij in krožnega gospodarstva: vpogledi z Univerze v Trstu

Univerze so ključni akterji, sposobni spodbujati družbene inovacije (angl. *social inovations* – SI) in pospeševati prakse krožnega gospodarstva (angl. *circular economy* – CE) preko izobraževanja, raziskovanja, sodelovanja s skupnostjo in notranjih upravljavskih praks. Prispevek obravnava Univerzo v Trstu (UNITS) kot študijo primera z namenom preučitve, kako lahko univerze spodbujajo sinergije med SI in CE. Z analizo poglobljenih sekundarnih in primarnih podatkov naša raziskava kartira dejavnosti, ki jih univerza izvaja za širjenje obeh paradigem, pri čemer jih posebej razvršča v štiri področja: poučevanje in vključevanje študentov; raziskave in prenos znanja; tretje poslanstvo in družbeni doseg; trajnostne prakse. Na podlagi tega kartiranja raziskava opredeli pet referenčnih dejavnosti z velikim vplivom na širjenje paradigem SI in CE: doktorski program krožnega gospodarstva, delovno skupino RUS Food, projekt ARETS Water, prilagodljivo ponovno rabo nekdanje vojaške bolnišnice (Ex-Ospedale Militare) in laboratorij Innovators Community Lab. Rezultati ponujajo pomembna izhodišča za oblikovalce politik in praktike ter izpostavljajo dejavnosti, ki bi jih bilo mogoče prenesti na visokošolske institucije po svetu.

Ključne besede: univerza, družbene inovacije, krožno gospodarstvo, trajnost, visoko šolstvo

 https://doi.org/10.26493/1854-4231.20.51-57

Introduction

Universities are increasingly recognised as pivotal actors in addressing societal challenges and shaping pathways toward sustainable and inclusive development. Beyond their traditional missions of teaching and research, universities contribute to the transformation of communities and societies by promoting social justice, reducing inequalities, and fostering inclusivity (Brundenius et al. 2016). Given their embedment in local and international communities, higher education institutions (HEIs) can act as precursors of change, also proposing solutions and good practices for organisations seeking to respond to global, environmental, and societal challenges. In this sense, universities can foster Social Innovation (SI), intended as the development and implementation of actions, services, or models that address social needs and reshape power relations (Benneworth and Cunha 2015). Past research has shown that universities can exercise this transformative role, suggesting actions impacting not only students, employees, and researchers, but also extending beyond organisational borders towards local, national, and international communities.

In the contemporary context, the European Union has stimulated the search and development of more sustainable ways and models to produce and consume in response to climate change pressures, waste management needs, and biodiversity loss. Intending to reduce the tonnes of waste produced every year, the European Union has spread the concept of circular economy (CE), a model based on resource efficiency, regeneration, and closed-loop systems. The CE paradigm requires organisational and cultural shifts to ensure long-term transitions, which is an aspect where universities can actively contribute through e.g., educational offerings and organisational practices.

While both SI and CE are gaining traction in the literature, the intersection between these two paradigms remains under-investigated. Extant studies have examined universities' contributions to social innovation (e.g., Bayuo et al. 2020; Menter 2024) and their involvement in sustainability transitions (e.g., Arocena and Sutz 2021), but few works have explicitly investigated how HEIs operationalize synergies between SI and CE. This constitutes a significant gap, given that universities not only educate future generations but also act as laboratories of experimentation where innovative practices can be tested, evaluated, and scaled up. Considering the University of Trieste as a case study, we explored its educational offerings, research projects, community engagement initiatives, and governance practices. By mapping sustainability initiatives implemented at the University of Trieste (UNITS), we identified and analysed five social innovations that also spread the CE paradigm.

Social Innovation in the University Context

Universities have long been recognised as key institutions for societal development, contributing not only to economic growth and technological progress but also to social transformation. Through their educational programs, research activities, and societal engagement, universities position themselves as central actors in promoting inclusive development (Brundenius et al. 2016). The concept of social innovation (SI) in the university context has increasingly become prominent, emphasizing its ability to develop and implement new ideas, services, and organisational models that meet social needs while challenging entrenched power relations (Benneworth and Cunha 2015). Besides the pure training and educational courses, universities are HEIs that offer curricula and extracurricular initiatives that can contribute to shaping new generations of socially engaged citizens (Bayuo et al. 2020). In terms of research and knowledge transfer, universities can favour activities that reduce power imbalances among categories in various contexts, whose results could be spread and disseminated in local and international contexts, both academic and open to citizens. Third mission activities typically engage a variety of stakeholders, also external ones, involving collaborations with public, private, and non-profit sectors. These collaborations often serve as experimental arenas for new models of participation, collective problem-solving, and capacity building, which could favour co-creation mechanisms of social value. In addition, universities are large organisations, which can introduce internal policies and governance mechanisms embracing social responsibility, able to influence their workforce and the community engaged with their activities daily. Menter (2024) encourages universities to increase their entrepreneurial approach towards social innovation missions, balancing their traditional focus on economic competitiveness with broader societal goals.

From Social Innovation to Circular Economy in Higher Education

As suggested by the Doughnut Economy perspective (Raworth 2018), aligning social and environ-

mental approaches is urgently needed to create economic models that can respect both the social foundations and the ecological ceiling, being sustainable in the long term. Thus, integrating SI and CE approaches could represent a good solution to favour systemic thinking to tackle complexities and address both social and ecological dimensions of sustainability (Arocena and Sutz 2021).

SI emphasizes equity, inclusivity, and favouring the reconfiguration or rebalancing of social relations, while the CE stresses environmental responsibility, regeneration, systemic efficiency, and minimum waste (Geisendorf and Pietrulla 2018). Universities are knowledge hubs that are better equipped to favour interdisciplinary research tackling sustainability societal challenges, which might require cutting across traditional academic boundaries and embracing perspectives and theories from diverse fields such as engineering, business, law, and social science. Universities can generate research that advances circular solutions in areas such as renewable energy, sustainable materials, systemic innovation for cities and regions. Also, universities can favour circular and sustainable transitions through internal practices, educational and dissemination activities (Mazzi and Battiston 2022). In higher education contexts, this integration could translate into opportunities to align their activities with the Sustainable Development Goals (SDGs). For instance, educational initiatives that combine SI and CE prepare students to think critically about how technological, organisational, and cultural changes intersect in sustainable transitions. Research that integrates SI-CE perspectives can foster more inclusive and impactful innovations, while university-community partnerships can test and implement practices that are both socially empowering and environmentally restorative. Although synergic efforts might lead to positive and high-impact returns, the research on this intersection is still limited, especially in the higher education context.

Methodology

We chose the case study design because it allows for an in-depth exploration of complex phenomena, which is particularly suitable for examining institutional practices that span across education, research, societal engagement, and governance (Eisenhardt 1989). We developed a mapping process to explore whether and how the University of Trieste (UNITS) has operationalized the integration of SI and CE in its activities. Through this screening process, we identified a selection of activities meeting both SI-CE approaches. Then, we adopted the qualitative approach to analyse in-depth an activity considered to have SI-CE related impacts (Eisenhardt 1989).

Following Bayuo et al. (2020), we identified four main fields of activities: (1) teaching and student engagement, (2) research projects, knowledge production and transfer, (3) third mission and societal outreach, and (4) sustainability practices and governance mechanisms. This framework guided the coding and categorization of initiatives' intersecting both SI and CE. Despite this, we acknowledge that lines among the categories are blurred.

We gathered data from multiple sources to ensure a comprehensive analysis and to enable data triangulation. As a key source, we used the integrated sustainability report of UNITS, which provides detailed information on the university's sustainability policies, projects, activities, and outcomes. To screen the educational offerings, we adopted a structured keyword-based screening of the course catalogue. We adopted two thematic keyword lists: the ones related to SI (e.g., *innovazione, inclusione, governance, co-design, engagement*) and the ones related CE (e.g., *economia circolare, sostenibilità, ambiente, lifecycle*). In addition, we also used keywords reflecting cross-cutting dimensions (*transition, resilience, adaptation, gender, eco-social change*) for control check. For each identified course, we extracted the course title, department/program code, type, impact (SI, CE, or SI+CE), and the keywords used for classification. As far as research projects are concerned, we contacted the central research office, which screened the comprehensive list of ongoing and completed projects by using keywords such as the ones indicated above. In addition, we also used the university's websites and project-specific portals to gather additional information on knowledge transfer, outreach initiatives, and partnerships with external stakeholders. As a result of this mapping activity, we identified five benchmark activities. To complement existing data, we also collected a semi-structured interview with a university employee working in the Innovators Community Lab to deepen its structure, objectives, activities, and impacts.

Results

UNITS contributes to SI-CE integration through diverse initiatives, including specialised courses and programs, interdisciplinary research pro-

jects, community engagement activities, and internal sustainability practices.

UNITS has embedded SI and CE principles within its educational offerings. Many CE-related courses refer to Architecture, Economics, and Engineering, while courses on management of innovation and sustainable agri-food systems in the Department of Economics, Business, Mathematics, and Statistics address both SI and CE. Gender and inclusivity topics are treated and discussed across several undergraduate and graduate programs in diverse fields such as law, literature, economics, and medicine. Examples include courses on gender violence, work–life balance, gender equality, and gender medicine, also addressing structural inequalities and promoting inclusivity. Besides, our analysis identified ten courses explicitly combining SI and CE paradigms, often linked to the United Nations Sustainable Development Goals (SDGs), in particular SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production). The interdisciplinary program *European Policies for Digital, Ecological and Social Transitions represents a relevant example*, as it encompasses courses on management of innovation, co-design of digital innovations for sustainability and inclusion, big data and open data for sustainability and social inclusion, stakeholder engagement for inclusive and sustainable communities, EU policies for sustainability and social cohesion, and law for sustainable technologies and innovation. Another notable example is *Sostenibilità e cambiamento sociale*, a course offered within the program *Scienze per l'ambiente marino e costiero*. There are also extracurricular learning opportunities fostering SI-CE competencies, such as open badge courses open to the entire student community and laboratories on topics related to e.g., ethics and science, entrepreneurship, workplace safety, and gender awareness. Summer schools, such as *Giacomo Ciamician's* interdisciplinary energy summer school and the *Blue Skills* summer school, promote knowledge exchange on sustainability transitions, renewable energy, and socio-economic innovation in coastal and marine sectors.

UNITS is strongly oriented to research activities with projects related to SI (e.g., Shaping Inclusive Tourist Experiences – SITE) or CE (e.g., sustainable paths to the holistic use of hemp – SPARE). Two research projects lie at the cross-border between SI and CE. WASTEREDUCE develops integrated waste reduction strategies in protected and natural areas in line with CE approaches, but also fosters social cooperation among institutions, communities, and stakeholders for this purpose. KRAS–CARSO II promotes sustainable development of the Carso area through cross-border collaboration, integrating tourism, cultural heritage, and sustainable mobility. Moreover, the university hosts interdisciplinary centres such as *Centro Interdipartimentale Migrazioni e Cooperazione Internazionale allo Sviluppo Sostenibile (CIMCS)*, the *Giacomo Ciamician Centre*, and the *Centro Interdipartimentale di Ricerca Studi di Genere (CIRSG)*, which support projects and dissemination activities in the fields of migration, sustainable development, circular solutions, and gender studies. In addition, the PhD Program in Circular Economy stands out as an interdisciplinary doctoral program training researchers in circular systems, sustainability, and innovation. This program promotes systemic thinking and public value creation by fostering a strong orientation toward addressing grand societal challenges through both SI and CE perspectives. In addition, UNITS has structured a variety of knowledge transfer activities, including patenting, licensing, and the creation of spin-offs and start-ups, which extend the research impacts beyond academia. These initiatives often support SI by addressing societal challenges such as health or environmental ones, e.g., by promoting sustainability-related technologies.

Through third mission activities, UNITS promotes value creation among its employees but also favours cooperation with external actors and local communities. For instance, the PROBENE-COMUNE project is strongly linked to SI, as it addresses the psychological and physical well-being of students and university staff. The university participates in the RUS Food Working Group, which integrates SI and CE by promoting sustainable food consumption and waste reduction, raising awareness about food justice and global inequalities.

UNITS invests in solar energy, energy-efficient buildings, waste separation systems, and the dematerialization of administrative processes, which align with CE principles of resource efficiency and long-term sustainability. In particular, the University invested in a consistent renovation project to restore the historical building Ex Ospedale Militare, a historic military hospital that was repurposed to host student dormitories, innovation labs, and open and collaborative spaces. The project embodies principles of adap-

Table 1. Benchmark Activities, Their Targets, and Impacts

Activity	Type	Target	SI-CE impact
PhD Program in Circular Economy	Education and research	PhD students, researchers, policy institutions, innovation-driven businesses	CE: stimulates systemic thinking and research on resource cycles, reuse, product life extension, and sustainable economic models (SDG8, SDG9, SDG11, SDG12). SI: promotes systemic thinking, public value creation, and long-term social innovation in sustainability governance (SDG13).
RUS Food Working Group	Community engagement, sustainable food systems	University staff, students, campus service providers, sustainability coordinators	CE: promotes waste reduction, sustainable procurement, and resource efficiency in food systems (SDG2, SDG3, SDG12, SDG13, SDG17). SI: promotes health and food equity principles (SDG2, SDG3, SDG12, SDG13, SDG17).
ARETS water project	Sustainability practices and governance	Students, academic and administrative staff, campus visitors	CE: reduces single-use plastic, promotes circular use of resources (tap water, reusable bottles), and fosters waste separation (SDG6, SDG12, SDG13). SI: encourages responsible behaviour within the academic community and across generations of students (SDG4, SDG6, SDG12, SDG13).
Renovation of Ex-Ospedale Militare	Corporate governance and practices	Students and PhD students	CE: applies circular principles through the adaptive reuse of existing building, reducing material and energy use (SDG11, SDG12, SDG13). SI: promotes social inclusion by providing accessible, affordable student housing — especially for economically or socially disadvantaged groups (SDG1, SDG4, SDG10, SDG11).
Innovators Community Lab	Higher education entrepreneurship and transfer	Students, venture capitalist, investors, PhD students	CE: stimulates innovative entrepreneurship, offers mentorship and prototyping labs that focus on minimizing environmental impact, by embedding CE principles within innovation practices (SDG9, SDG12). SI: gives power to students by favouring accessibility to funding, networking opportunities, collaborative practices and favouring entrepreneurship and venturing (SDG4, SDG8, SDG9, SDG10).

tive reuse and sustainable renovation, preserving architectural heritage, minimising environmental impacts, and expanding affordable accommodation for students. This building now also hosts the Innovators Community Lab (ICL), formerly known as the Contamination Lab, which serves as a co-creation space where students, researchers, and external stakeholders collaborate to address real-world challenges. The lab organises hackathons, mentoring programs, and training in entrepreneurship and business model design for students. It fosters inclusivity and collaboration while promoting innovation and entrepreneurship among students, also favouring networking with venture capitalists, companies, and institutions.

UNITS has also adopted several internal policies and practices integrating SI and CE principles into institutional governance. UNITS has implemented policies to foster inclusivity and prevent discrimination, such as the Code of Conduct for the Prevention of Harassment and the Single Guarantee Committee for Equal Opportunities (CUG), and the 'Trust Counselor'. These measures show the university's commitment to social justice, equity, and dignity at work, reducing power imbalances and promoting a safe, inclusive environment. As an outstanding activity at the SI-CE nexus, the ARETS water project aimed at reducing plastic waste and encouraging responsible water consumption through the installation of water dispensers in the university campuses and the distribution of reusable bottles. This high-impact project promotes resource efficiency while engaging the broad academic community in environmentally responsible behaviour, whose

influence can spread across generations of students, promoting long-lasting positive attitudes towards conscious water consumption also after their graduation.

As benchmark activities, we identified the PhD Program in Circular Economy, the RUS Food Working Group, the AReTS water project, the adaptive reuse of the Ex-Ospedale Militare, and the Innovators Community Lab, which exemplify the highest SI-CE impact activities in terms of variety and vastness of targets reached. Table 1 describes the types, targets, and impacts of each activity.

Our analysis has shown that UNITS has implemented activities that were initially conceived to foster only SI or CE, which then had broader and extended impacts towards the other paradigm. Although SI and CE were initially conceived as separate domains, we found they can intersect in meaningful ways, in line with studies emphasising the social dimension of CE (Mies and Gold 2021). For instance, the PhD Program in Circular Economy integrates scientific training and fosters research skills with a broader mission of creating public value by favouring circular business models and economic systems, while the RUS Food Working Group simultaneously addresses environmental sustainability and food justice. Similarly, the ICL, located in the renovated historical building Ex Ospedale Militare repurposed to student activities, demonstrates how entrepreneurial education can combine inclusivity, collaboration, and sustainability, while empowering and offering opportunities to students with innovative ideas, increasing accessibility to education, and creating networking opportunities. Our analysis suggests that the SI-CE distance can be reduced, emphasizing the role of universities as actors capable of bringing multidimensional contributions to sustainability transitions. This might be the result of the demanded convergence between societal and ecological needs when conceiving solutions to the grand challenges (Raworth 2018). Still, projects combining both paradigms are rare, showing that even though universities are well-positioned to link SI and CE, systematic integration requires purposeful strategies and interdisciplinary collaboration.

Conclusions and Limitations

From a theoretical standpoint, this study emphasises the role of universities in promoting and fostering SI-CE paradigms, also embracing mission-oriented innovation that balances economic, social, and ecological outcomes (Menter 2024). However, the coexistence of SI and CE initiatives within universities does not automatically guarantee integration, which instead requires a sense of purpose and a clear strategic orientation.

As practical and policy implications, we describe replicable initiatives and models for other universities and public institutions willing to contribute to the green and digital transitions. Initiatives such as the European Green Deal and the European Education Area emphasize the role of higher education in driving ecological sustainability, social inclusion, and innovation. By integrating SI and CE perspectives, universities can pursue their strategic objectives while strengthening their societal impact. From this view, regional and European policymakers might leverage universities as strategic partners and role models in the green and digital transitions.

This study has limitations related to the keyword-based approach used to select projects and courses, which may not be free from omissions, and the sustainability report used as a key source, which may reflect institutional priorities and self-reporting biases.

Acknowledgements

This project was funded through the Transform4Europe: Seed Funding – First Call, under the project title The Role of T4EU Universities in Supporting Social Innovations in the Field of Circular Economy. We gratefully acknowledge the support provided by Transform4Europe, which made this research possible. We also thank Anastasiia Saveleva for her involvement in the project and for collecting the interview with the ICL coordinator.

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