POLITECNICO DI TORINO
Repository ISTITUZIONALE

Implementing Circular Economy in Universities. Successful Practices at Politecnico di Torino (Italy)

Original
Implementing Circular Economy in Universities. Successful Practices at Politecnico di Torino (Italy) / Lombardi, P., Genta, C., Colaleo, V.. - In: JOURNAL OF SUSTAINABILITY PERSPECTIVES. - ISSN 2797-7137. - 3:1(2023), pp. -68. [10.14710/jsp.2023.19963]

Availability:
This version is available at: 11583/2984890 since: 2024-01-08T10:09:19Z

Publisher:
SDG Center Universitas Diponegoro

Published
DOI:10.14710/jsp.2023.19963

Terms of use:

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

Publisher copyright

(Article begins on next page)

18 November 2026

Journal of Sustainability Perspectives

journal homepage: https://ejournal2.undip.ac.id/index.php/jsp/



Implementing Circular Economy in Universities. Successful Practices at Politecnico di Torino (Italy)

Patrizia Lombardi[1], Chiara Genta[2], Valentina Colaleo[2]*

[1]*Interuniversity Department of Regional and Urban Studies and Planning (DIST) – Politecnico di Torino, 10125 Turin, Italy*

[2] *Direzione Campus: Logistica e Sostenibilità (CALOS) – Politecnico di Torino, 10129 Turin, Italy*

Corresponding author: chiara.genta@polito.it

Article Info

Received:
23 May 2023
Accepted:
25 June 2023
Published:
30 July 2023

DOI:
10.14710/jsp.2023.19963

Presented in the 9th International Workshop on UI GreenMetric World University Rankings (IWGM 2023)

Abstract. The circular economy (CE) concept reported a growing interest as an operationalizing framework, able to support the implementation of sustainable production and consumption, resource use and waste prevention broader concepts. Even if CE is different from waste management, it has traditionally been associated with waste reduction, recycling improvement, and minimization of environmental impacts in cities and territories. Additionally, CE could be a driver for the achievement of multiple Sustainable Development Goals (SDGs). On the other side, universities are recognized as key actors in the transition towards sustainable development at the territorial level. Given the use of CE as a possible change paradigm to decouple economic growth from associated environmental impacts, this paper aims at highlighting some of the main successful practices put forwards by an Italian university, Politecnico di Torino, in implementing CE principles.

Keyword:
Circular Economy, University Sustainability, waste management

1. Introduction

Higher Education Institutions (HEIs) with their long development timeframes, structured department and administrations, and a monitorable population, are ideal places to study the application of sustainability strategies and policies. [1] At the same time, universities may be viewed as a community with significant direct and indirect impacts on the environment. At the global level, the impact of human activities on the environment is one of the main challenges of our time. Circular Economy (CE) is increasingly adopted as a key concept to foster sustainability implementation and accelerate the achievement of multiple goals of the UN 2030 Agenda. [2-3] However, the concept of CE is usually associated with waste management and efficiency processes. However, it represents an actual strategy

to simultaneously achieve multiple Sustainable Development Goals (SDGs). [4-6]

Universities can contribute to the achievement of SDGs in many ways. [7], by providing the knowledge, innovations, and solutions to the SDGs, training future SDGs implementers, demonstrating how to adopt and implement SDGs in governance, operations, and culture, and developing cross-sectoral leadership to guide the SDG response.

At the national level, the Italian University Network for Sustainable Development (RUS in the Italian acronym) is working since 2013 with the aim of spreading the culture of sustainability and increasing the social impact of universities' activities, in order to contribute to the achievement of the SDGs and to strengthen the value of the Italian experience at international level.

RUS is organized into eight working groups (WGs), one of which is dedicated to Resources and Waste. The Resource and Waste WG gathers and disseminates practices on the topic to raise awareness and steer people toward sustainable behaviors. [8] Politecnico di Torino (PoliTo) is the general coordinator of the network since 2019 and it is committed to supporting the ecological transition of communities inside and outside the campus by facilitating the connection between academia and territorial context. During PoliTO coordination the green offices at the national level have been triplicated and the sustainability paradigm has been included in university statutory of a large number of universities.

PoliTo is also very much active in promoting CE strategies and activities inside the management of its own campuses. This paper aims at presenting the most successful practices carried out by PoliTo in order to implement CE principles in campus management and contribute to the achievement of sustainability targets at the local scale. The reported activities are grouped into three main categories, including (i) monitoring activities, (ii) waste management programs, and (iii) awareness campaigns and activities.

2. Circular Economy implementation in campus management at Politecnico di Torino

PoliTo was the first Italian engineering school, founded in 1869 and located in Turin, in the northwest of Italy. Nowadays PoliTo is one of the top European technical universities with more than 38 000 enrolled students and around 2000 faculty and administrative staff.

In 2015, the Green Team was created as a multidisciplinary team of faculty members, employees, and students to align university strategies toward sustainable development. The Green Team is currently organized into five WG, namely (i) education and public awareness, (ii) energy and climate, (iii) mobility and transport, (iv) resources, and (v) equity and inclusion.

The WG Resources promotes the reduction of consumption by discouraging waste production and by favoring recycling and reuse policies with a view to CE principles. In particular, the WG activities focus on:

- The management of waste disposal which translates into reducing and rationalizing waste and thus decreasing its environmental impacts, following the "reuse-recycle-reduce" approach with a view to complete closure of the product life cycle in a sustainable manner;
- The management of water resources by monitoring consumption and promoting strategies to reduce waste;
- The enhancement of the sustainability of the agri-food supply chains (through the

valorization of local products and encouragement of guidelines for catering suppliers within the university);

- The responsible management of the procurement of consumer goods, following the guidelines of green public procurement (GPP protocols) so as to respect the environment without forgetting the cost-effectiveness of procurement.

In the next subsections, the main successful initiatives are presented including the results achieved and future perspectives.

2.1. Monitoring

The monitoring of the effectiveness and the impact of activities related to CE implementation is crucial for different reasons, for example, the assessment of the university's sustainability performance, the definition of new strategies and actions, and the participation in international sustainability ranking (e.g., UI Green Metric).

The monitoring of waste production is performed on a standard base to quantify the average production of waste and the quality of waste separation. The monitoring is performed mainly by a survey filled in by students based on direct observations. Inside the survey, the quantities and qualities of waste located in bins and collection islands of the public spaces (internal and external) are reported. Those surveys are performed at different moments of the day and during the academic year in order to verify the correct dimensions and location of bins and identify possible critical situations.

Additionally, a student team is working with the WG Resources of the Green Team to improve the data collection of the production of waste including IoT elements. The team has designed, prototyped, and installed (in one experimental bin) sensors for the monitoring of waste production both in terms of quantities and in terms of quality. In fact, part of the project is based on the use of artificial intelligence to identify the correct separation of waste and the interaction with users in order to inform and educate them about the correct separation of waste.

Preliminary data about waste production highlights that the mostly produced waste fractions are plastic and paper, while organic waste, glass, and cans represent secondary waste sources (Figure 1). In this sense, most of the CE-related top-down activities in PoliTo focus on the prevention of the production of waste for paper and plastic waste.

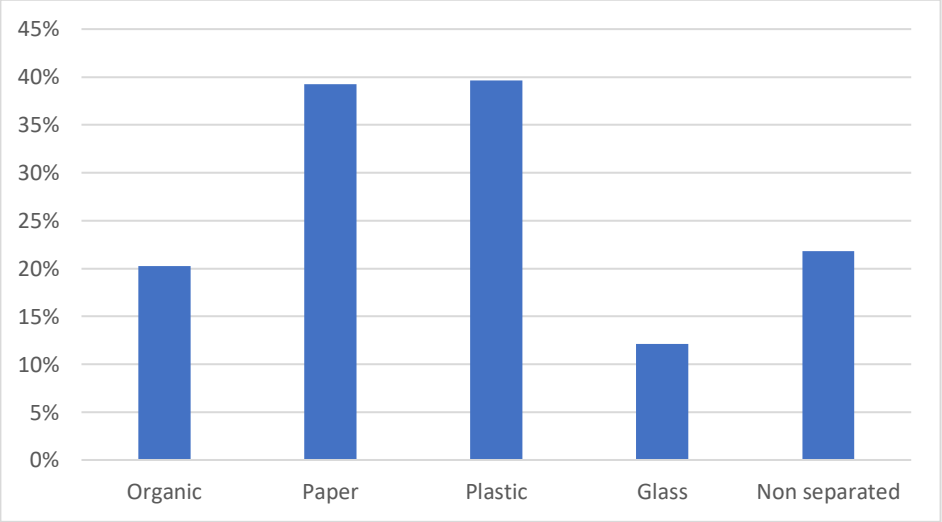


Figure 1. The average level of filling of recycling areas, divided by fractions.

2.2. Waste Management Programs

PoliTo has an extensive recycling policy. All wasted materials are collected in differentiated bins for the following waste fractions, paper, plastic, glass and cans, organic, and unsorted. The recycling islands have a standardized visual identity in order to facilitate the disposal of waste from the university's users (Figure 2). Dedicated collection processes concern the recycling of special waste such as toxic materials, batteries, and EEE waste.



Figure 2. New recycling areas

In order to prevent and reduce the amount of produced plastic and paper waste some specific programs were developed. Regarding plastic waste, the dedicated activities focus on the distribution of reusable bottles and the ban on single-use plastic in canteens. The distribution of reusable bottles to new students and employees aims at reducing the purchase of single-use plastic bottles and was associated with the installation of free drinking water fountains in the campus. Starting from October 2018, the installation of new indoor and outdoor drinking water points, offers the opportunity to choose an alternative to plastic every day.

The PoliTo canteens are plastic-free (Figure 3). Since 2018, in all student's canteen, PoliTo eliminated single-use plastic items also with the installation of new drinking water free points. The university introduced innovative packaging and recycling solutions, such as reusable materials, bioplastics, and organic material, to help eliminate plastic waste from ending up in landfills.



Figure 3. Activities related to the limitation of single plastic use

Regarding paper waste, specific printing policies have been developed to avoid the non-necessary use of paper. All printers and multifunction devices installed on the campus are "network connected" in order to manage the fleet remotely. This allows PoliTo to implement centralized printing managing policies on all the devices set on the campus (i.e., printing "front/read" by default, "economy mode" by default, etc.). A specific policy has been developed by the IT department to ensure that users print with limited "quotas" controlled centrally by means of specialized management software (PaperCUT). In fact, PaperCUT define a specific amount of printable copies for each user, especially students, with warnings and alarms dispatched on the approximation of the "quota". The tool allows the university to increase the accountability of printing services and improve the awareness of users stimulating correct uses and behaviors. Specific communications and "advertising" integrated with flyers are located near the printing areas and in front of the devices to encourage users to better print and copy.

2.3. Awareness campaigns and activities

To make the above-mentioned action effective it is crucial to involve the community of the campus. One of the main communication strategies about the commitment of the university toward waste reduction and CE strategies promotion concerns the production of sustainable gadgets. The reusable bottles which are distributed to new students and employees starting from 2018 bring the message of concern about the prevention of plastic pollution. A new campaign for the production of sustainable gadgets focused instead on the reuse of PVC banners used in exhibitions and institutional festivals and which cannot be reused anymore. The PVC material is reused with the support of local artisans and workshops for the creation of small bags and gadgets distributed to PoliTo employees.

In addition to the design and production of merchandising items, some awareness communication campaigns were developed. Some examples regard the organization of "restart parties" in collaboration with student teams. During the event students with a technical background and expertise give support for the repair of small electronic devices in order to prevent them from being thrown away and inform on the correct disposal of EEE waste. Finally, The Waste Mob is an annual event to promote urban waste collection through a game-based approach. During the Waste Mob, each team of participants is called to collect the most possible waste and separate the recyclable fractions in the correct manner.

3. Concluding remarks

The circular economy is a very broad concept dealing with the implementation of sustainable production and consumption, resource use, and waste prevention. These activities are crucial at the university campus level considering the role model universities have to play for society.

A number of Italian universities belonging to the RUS network have already implemented CE activities. Among these, PoliTo is strongly committed to contributing to waste reduction and the promotion of CE in its campus management activities. The adopted approach combines top-down policies with awareness and participative initiatives to engage the university users and the local community. Finally, the monitoring activity is considered crucial in order to verify the effectiveness of the design strategies, identify the most critical areas and measure the impact generated on the achievement of local sustainability targets and global SDGs.

References

[1] Sonetti, G., Lombardi, P., & Chelleri, L. (2016). True green and sustainable university campuses? Toward a clusters approach. *Sustainability (Switzerland)*, *8*(1). https://doi.org/10.3390/su8010083

[2] Ellen MacArthur Foundation. (2013). *Towards the circular economy. Economic and business rationale for an accelerated transition*. 23–44.

[3] UN. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*.

[4] Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The Circular Economy – A new sustainability paradigm? *Journal of Cleaner Production*, *143*, 757–768. https://doi.org/10.1016/j.jclepro.2016.12.048

[5] Ghisellini, P., Cialani, C., & Ulgiati, S. (2016). A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, *114*, 11–32. https://doi.org/10.1016/j.jclepro.2015.09.007

[6] Heshmati, A. (2017). A review of the circular economy and its implementation. *International Journal of Green Economics*, *11*(3–4). https://doi.org/10.1504/IJGE.2017.089856

[7] SDSN Australia Pacific. (2017). *Getting Started With the SDGs in Universities. A guide for universities, higher education institutions, and academic sector*. http://ap-unsdsn.org/wp-content/uploads/2017/08/University-SDG-Guide_web.pdf

[8] RUS. (2022). *Universities for the Regions in the year of Climate Ambition. RUS Activities Report 2021*. https://reterus.it/public/files/Documenti/Report_RUS/REPORT_RUS_2021_D_ENG.pdf