

Transformation to a Circular Economy through Public Procurement? An analysis of local and regional calls for tender using GPT-4

Abstract

Public Procurement, accounting for approximately 14% of GDP in the European Union, has significant potential to support sustainability transitions. This can be achieved through stimulating demand for innovative products and processes (e.g. Public Procurement for Innovation), or taking a lifecycle perspective for considering environmental impacts (e.g. Green Public Procurement). Increasingly circular economy (CE) is becoming of interest in procurement practices, for example through embedding circularity into supplier selection and evaluation processes. To understand how CE considerations are currently incorporated into procurement practices, this research uses an automated content analysis (ACA) approach through a large language model (GPT-4), applied to a selection of 89 calls for tender from the European Union's Tenders Electronic Daily (TED) database. These notices met the criteria of: matching the keyword search "circular economy"; published in the year 2023; conducted under an open procedure; focused only in one country; and issued by a local or regional authority. The framework underpinning the ACA is based on CE characteristics and urban transformative capacities. The ongoing findings reveal only 60% of notices include criteria beyond price, and just 20% reference explicit CE related practices in supplier requirements or project descriptions. Future research will refine the analytical framework and expand the dataset across multiple years. These enhanced findings aim to contribute to the development of more robust criteria for operationalising CE strategies, which will build organisational capacities in local and regional governments.

Introduction

Public procurement represents approximately 14% of Gross Domestic Product (GDP) in EU nations (European Commission, 2025), and is recognised as a demand-side instrument with potential for shaping markets and supporting sustainability transitions, addressing a variety of challenges including climate change, resource use, and environmental pollution (Sun et al., 2024). Established practices of public procurement as a policy instrument include Green Public Procurement (GPP); Sustainable Public Procurement (SPP); Public Procurement for Innovation (PPI). This research focuses on GPP, which emphasises the reduced lifecycle of environmental impacts on goods and services. Additionally, PPI, a demand-side instrument that shapes market activity towards supporting and scaling up innovative products and processes, is relevant for the transition that is important in advancing the growing research concept of circular public procurement (CPP). The focus on lifecycle perspectives of product, service and works procurement (the basis of GPP), combined with supporting innovation (PPI) and providing materials for others to learn from is important to further establish CPP practices (Alhola et al., 2019; Sönnichsen & Clement, 2020).

Moving towards increased CE models can help achieve economic stability and reduce external shocks (Bourdin & Torre, 2024). Recent policy directives, such as the EU Circular Economy Action Plan (CEAP) states that circular economy should deliver "sustainable activity in key sectors and new business opportunities...[which] will help to unlock the growth and jobs potential of the circular economy" (European Commission, 2015). The new circular economy action plan (2020) highlights a role for public procurement, discussing the imposition of mandatory criteria and targets for public buyers relating to GPP. However, what is currently missing is an integration of circularity requirements into public procurement objectives, which would help achieve the aim that "all products placed on the EU market become increasingly sustainable and stand the test of circularity" (European Commission, 2020, p. 3). The important mechanism here is the development of demands and criteria for suppliers to be selected for government contracts (Alhola et al., 2019).

Despite this promise, local authorities often lack the capacities to capture the opportunities from public procurement for driving circular transitions. This is partly due to the lack of precise definition of what constitutes a circular economy (Kirchherr et al., 2017). Learning from previous approaches can help to determine most promising selection and evaluation criteria for suppliers. However, the volume of calls for tender in public procurement in the EU and award notices referencing circular economy are not possible to analyse manually (Acikalin et al., 2024). This opens a role for automated and large language model (LLM) approaches for institutional learning (Vlachos & Reddy, 2025). Building on the preliminary work conducted and presented by the authors at the 2025 ERS Congress, this paper advances the research to address the following research questions:

1. How do local and regional authorities understand CE within green public procurement strategies?
2. How can insights from previous calls for tender inform the development of future CE-oriented procurement strategies and contribute to the emerging CPP concept?

Method

This paper extends on ongoing research which analyses Calls for Tender documents across the European Union, published in the Tenders Electronic Daily (TED) database.

Process

Learning from previously deployed criteria and project descriptions is a useful tool for standardising and advancing CPP strategies in Local Authorities. Automated Content Analysis (ACA), informed by Hase (2022) through the use of a large language model (GPT-4) allows for the systematic examination of emerging patterns covering the overlap between CE and sustainability-oriented public procurement.

Dataset

The TED database is connected to the EU's 'Supplement to the Official Journal' for Public Procurement, listing contracts for supplier and service contracts above a monetary value of 221 000€ for local and regional authorities (Commission of the European Union, 2014). Active notices published between 01.01.2023 and 31.12.2023 were extracted that met the keyword search criteria "circular economy", filtered for activities taking place in a single country under an open procedure. 269 documents were returned, of which 89 involved local or regional authorities. An analysis framework based on qualitative and quantitative criteria drawing on circular economy indicators (Saidani et al., 2019; Wurster & Ladu, 2022) and urban transformative capacities (based on Wolfram, 2016) were operationalised to develop prompts for the ACA. These covered attribute information (e.g. on contract period, country of origin, award criteria and weighting); quantitative measures of resource efficiency, longevity, circularity, and environmental and social sustainability considerations; as well as qualitative descriptions on these characteristics plus innovation and market development. Fine-tuning of these prompts were used on a sub-sample of 20 notices to guide and calibrated the model's classifications.

Findings

The findings highlight a gap between EU policy ambitions and local procurement practices. Quantitative analysis highlights how only 60% of the award notices include criteria other than price. This is despite these documents being selected specifically because they meet the keyword criteria of circular economy. Only 20% explicitly incorporate CE practices into their award criteria and description for suppliers. Where qualitative measures are included, these often refer to vague environmental statements that lack clear operationalisation that can be translated into quantifiable and

easily assessable criteria for local and regional authorities to act upon. This research develops tools which can be used by local and regional governments to increase the knowledge and ability to operationalise circular economy criteria in calls for tender. Doing this enables further development of their criteria in calls for tenders and the descriptions of CE-oriented projects for future activities. Automated textual analysis methods such as LLM-based ACA enable the evaluation of large data sets and evaluating the crucial criteria that support future policy development and build knowledge capacities for local and regional authorities.

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