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Accounting for Circular Economy Performance in Collaborative Initiatives in Cities

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JUSTYNA AGATA BEKIER

MORE THAN A NUMBERS GAME

Accounting for circular economy performance in collaborative initiatives in cities

More than a numbers game

Accounting for circular economy performance in collaborative initiatives in cities

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Justyna

Abstract (English)

This PhD thesis sets out to explore how circular economy performance is managed and accounted for in collaborative initiatives in cities. While no universally agreed definition of circular economy currently exists, it is often referred to as a model of production and consumption that aims at decoupling economic growth from natural resource depletion and environmental degradation. Circular economy is often discussed in opposition to the dominant 'take-make-use-dispose' approach whereby natural resources are extracted and converted to products, which are then used and disposed of in a short timeframe. As such, circular economy is frequently debated in both academic and practitioner circles as a means to achieve long-term sustainability.

Cities explore the concept of circular economy in order to increase competitiveness, attract investment, mitigate the consequences of the looming climate crisis, and become 'future-proof'. As circular economy implementation on a city level requires cross-sector collaboration, various initiatives emerge with a goal to 'co-develop', test, and scale circular economy solutions. These collaborative initiatives gather different actors, who represent various and often conflicting interests, visions of urban development, and understandings of circular economy. For these initiatives to reach the desired goals, they require not only effective management but also systems that facilitate information flows, dialogue, and debate. Public sector accounting literature suggests that performance accounting can play such a role in collaborative initiatives.

However, as multiple values are at play and different actors present their own definitions of circular economy, the understanding of what performance means in such contexts and how it should be accounted for in practice remains unclear. Traditionally, the literature has focused on performance accounting and management as instruments for organisational control and decision-making. Most often performance measures are

expressed in numerical form, for instance via Key Performance Indicators (KPIs) or budgetary information. Yet, little is known about what forms performance accounting could take if it should be used to promote participation and inclusion of various actors' interests and understandings of circular economy. Looking at collaborative initiatives in cities different questions arise: If circular economy solutions should be co-developed in cities, can performance accounting systems be co-developed too? Can city initiatives look beyond the various performance accounting systems that proliferate in academic and practitioner sources, and develop new ways to account for and manage circular economy performance? How can city initiatives deal with accounting for performance beyond the most commonly addressed environmental dimension of circular economy?

This PhD thesis examines these issues by studying performance accounting practices 'in action', following an EU-wide project focused on development and implementation of circular economy solutions in six European cities. It consists of three separate yet interconnected articles, where each article explores an aspect of accounting for circular economy performance in collaborative initiatives in cities. The first article highlights the multitude of circular economy performance narratives and finds that their diversity and dynamic development create issues for harmonised performance assessment approaches. The second article illustrates the spontaneous, unstructured manner in which performance accounts are generated, which contradicts the approaches advocated for in sustainability accounting literature. Lastly, the third article provides an empirical account of how performance indicators are constructed in a context of 'circular city'.

Overall, this thesis confirms that accounting for and management of performance remain important tasks in collaborative initiatives in cities, not only in guiding decision-making, but also in enhancing communication between stakeholders, fostering dialogue, and granting visibility to different understandings of 'good' circular economy performance. This thesis further illustrates that engaging with Actor-Network Theory as a theoretical lens helps explore accounting practices beyond actors' organisational boundaries

and observe how different voices in a collaborative initiative are translated into performance accounts. By providing rich empirical accounts of participatory, bottom-up accounting practices, this thesis highlights that performance accounting has the potential to increase stakeholder inclusion and representation. As such, performance accounting has a chance to embrace dialogic accounting practices and escape the conception of entity-based accounting that privileges the needs of a narrow group of selected stakeholders.

Abstract (Danish)

Denne ph.d.-afhandling har til formål at undersøge, hvordan præstation inden for cirkulær økonomi håndteres indenfor samarbejdsinitiativer i byer. Mens der ikke eksisterer én universelt accepteret definition, så henviser cirkulær økonomi ofte til som en produktions- og forbrugsmodel, der sigter mod at afkoble økonomisk vækst fra udtømning af naturressourcer og miljøforringelse. Cirkulær økonomi diskuteres ofte i modsætning til den dominerende 'take-make-use-dispose' tilgang, hvor naturressourcer udvindes og omdannes til produkter, som derefter anvendes og bortskaffes indenfor kort tid. Dermed diskuteres cirkulær økonomi ofte i både akademiske og professionelle kredse som et middel til at opnå langvarig bæredygtighed.

Byer udforsker konceptet cirkulær økonomi for at øge konkurrenceevnen, tiltrække investeringer, reducere konsekvenserne af den forestående klimakrise og blive 'fremtidssikre'. Da implementeringen af cirkulær økonomi på byniveau kræver samarbejde på tværs af sektorer, opstår der forskellige initiativer med det formål at samudvikle, teste og skalere løsninger inden for cirkulær økonomi. Disse samarbejdsinitiativer samler diverse aktører, der repræsenterer forskellige og ofte modsatrettede interesser, visioner for byudvikling og forståelser af cirkulær økonomi. For at disse initiativer kan opnå de ønskede målsætninger, kræves der ikke kun effektiv ledelse, men også systemer, der faciliterer informationsdeling, dialog og debat. Litteraturen inden for offentlig økonomistyring antyder, at præstationsregnskab kan spille en sådan rolle i samarbejdsinitiativer.

Da der er flere værdisætninger i spil, og forskellige aktører fremlægger deres egne definitioner af cirkulær økonomi, forbliver forståelsen af hvad præstation betyder i denne kontekst, og hvorledes dette bør håndteres i praksis, uklar. Traditionelt set har litteraturen fokuseret på 'performance accounting and management' som instrumenter til organisatorisk kontrol og beslutningstagning. Ofte udtrykkes præstationsmål numerisk, f.eks. via

nøgletal (KPI'er) eller budgetinformation. Dog er der begrænset viden om, hvilke former 'performance accounting' kan antage, hvis det skal bruges til at fremme deltagelse og inkludering af forskellige aktørers interesser og forståelser af cirkulær økonomi. Når man ser på til samarbejdsinitiativer i byer, opstår forskellige spørgsmål: Hvis løsninger inden for cirkulær økonomi skal samudvikles i byer, kan 'performance accounting' metodikker så også samudvikles? Kan byinitiativer se ud over de eksisterende økonomi- og præstationsstyring metodikker, der er udbredt i akademiske og professionelle kilder, og udvikle nye metoder for 'performance accounting' inden for cirkulær økonomi? Hvordan kan byintiativer håndtere 'performance accounting' ud over den mest almindeligt behandlede miljømæssige dimension af cirkulær økonomi?

Denne ph.d.-afhandling undersøger disse spørgsmål ved at studere 'performance accounting' metoder i et EU-bredt projekt fokuseret på udvikling og implementering af løsninger indenfor cirkulær økonomi i seks europæiske byer. Den består af tre separate, men sammenkoblede artikler, hvor hver artikel udforsker et aspekt af 'performance accounting' indenfor cirkulær økonomi i samarbejdsinitiativer i byer. Den første artikel fremhæver mangfoldigheden af narrativer om præstation indenfor cirkulær økonomi og finder, at deres mangfoldighed og dynamiske udvikling skaber problemer for harmoniserede tilgange til præstationsvurdering. Den anden artikel illustrerer den spontane og ustrukturerede måde, hvorpå 'performance accounts' udvikles, hvilket modsiger de tilgange, der anbefales I litteraturen om bæredygtighedsregnskab. Endelig giver den tredje artikel en empirisk redegørelse for, hvordan præstationsindikatorer konstrueres indenfor konteksten af en 'cirkulær by'.

Overordnet set bekræfter denne afhandling, at 'performance accounting and management' forbliver vigtige opgaver i samarbejdsinitiativer i byer, ikke kun for at vejlede beslutningstagning, men også for at styrke kommunikationen mellem interessenter, fremme dialog og synliggøre forskellige forståelser af 'god' præstation for cirkulær økonomi. Denne afhandling illustrerer desuden, at brugen af Actor-Network Theory som

teoretisk tilgang gør det muligt, at udforske økonomistyringsmetoder der rækker ud over aktørers organisatoriske grænser og observere, hvordan forskellige stemmer i et samarbejdsinitiativ oversættes til 'performance accounts'. Ved at give detaljerede empiriske redegørelser for deltagende økonomistyringsmetoder fremhæver denne afhandling, at 'performance accounting' har potentiale til at øge inddragelse og repræsentation af interessenter. Således har 'performance accounting' en mulighed for at imødekomme 'dialogic accounting' og undslippe enheds-fokuseret økonomistyring, der favoriserer behovene hos en smal gruppe af udvalgte interessenter.

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Introduction

This thesis explores the issue of accounting for performance in circular city initiatives, which, among concepts such as 'smart city' (Argento *et al.,* 2020) or 'sustainable city' (Brorström *et al.,* 2018) are becoming an increasingly common way for cities to remain competitive (Kornberger and Carter, 2010) and progress on matters of sustainable development. As a point of departure, the ambition of a circular city rests on a definition of a city as a *"complex, dynamic ecosystem through which resources flow between a myriad of actors, across multiple scales and sectors"* (Williams, 2019, p. 2751). Within this ecosystem, the city life and delivery of public services are organised in collaborative, multi-stakeholder initiatives, where collaboration can be understood as *"working together in a communal approach characterised by mutuality and a focus on common goals"* (Killian and O'Regan, 2020, p. 1), exercised in attempt to achieve 'common good'[1] (Killian and O'Regan, 2020). The collaborative initiatives function as 'networks of organisations' that often exchange information and use different tools to account for and manage their progress (Brorström *et al.,* 2018). However, there are two key challenges to accounting for performance in such arrangements.

[1] The definition of 'common good' varies depending on perspective taken. It is here understood in line with Thomas Aquinas' conception of common good, discussed by Killian and O'Regan (2020), whereby "*common good as a whole is greater than the sum of the good of all the individuals*" (2020; p. 2). In other words, common good is greater than the aggregate of individual self-interest and includes key elements of social relationships, interdependencies, and collaborations. This perspective poses an issue for accounting, which has to date developed as a primarily individual activity, under the assumptions that all entities strive in the same direction and good performance of individual entity will contribute to overall common welfare. As such, accounting has been practiced with focus on entity itself rather than on collaborations or relationships.

First, the common goal of achieving 'circularity' presents a challenge, as the concept of circular economy has been consistently criticised in the literature for its blurriness and 'emptiness' (Corvellec *et al.,* 2020), thus leaving room for individual interpretation of what a shared vision could be for the actors involved. Given the inherent, often irreconcilable differences between stakeholders in city initiatives (Grossi and Trunova, 2021), the definition of shared vision of circularity and, in turn, of what constitutes 'good' circular economy performance can be difficult. Second, given that collaboration has been recognised as essential for the development and introduction of new strategies in cities (Grossi and Trunova, 2021) and of circular economy solutions (Ghisellini *et al.*, 2016; Prendeville *et al.*, 2018), performance information should therefore be generated to improve the outcomes of collaborative efforts (Almqvist *et al.*, 2013) and to enable and promote trust between organisations engaged in collaborative action (Killian and O'Regan, 2020). This understanding of the role of accounting differs from the more traditional use, where accounting in general, and performance measurement in particular, serve as instruments of management control and decision-making (Speklé and Verbeeten, 2014; Hood, 1995). In this context, some scholars suggest that performance accounts should therefore be co-developed (Bourmistrov and Mouristen, 2022), or, at the minimum, the focus of accounting should shift from '*a solely organisation-based analysis'* (Tregidga and Milne, 2022, p. 17) *to 'reflecting and building trust, democracy, collaboration, confidence, well-being, participation, inclusiveness, fairness, public value and (possibly) happiness'* (Steccolini, 2019, p. 270). However, little empirical evidence exists of accounting practices that focus on accounting for the 'common good' (Killian and O'Regan, 2020) or that deal with the 'wicked problems' of our times (Jacobs and Cuganesan, 2014).

Given the emphasis on quantification and 'accountingization' (Power and Laughlin, 1992) in the public sector, as well as the sector's ambitions to improve efficiency and effectiveness in response to financial and competitive pressures (see Arnaboldi and Azzone, 2010; Speklé and Verbeeten, 2014), cities and city initiatives do attempt to identify or develop

performance measurement systems that can capture the complexity of their networks and of their performance outcomes (Argento *et al.,* 2020). However, circular economy and sustainability lack a streamlined accounting practice; in fact, multiple and divergent indicators and methods to account for circular economy performance exist (Merli *et al.*, 2018; Wishart and Antheaume, 2021). Furthermore, considering the new roles that accounting is expected to take in collaborative initiatives, it is thus possible that circular city initiatives will rely on creating their own management tools and performance indicators.

Therefore, this thesis is guided by the overarching question of: *How is circular economy performance accounted for in collaborative initiatives in cities?*

In asking this question, this thesis is interested both in enriching the empirical evidence of performance measurement practice in the interdisciplinary accounting research and in contributing to the ongoing debates in the field. Firstly, it requires an exploration of how performance is understood and narrated in collaborative initiatives (Article 1: "Narratives of sustainability performance in city initiatives and their relation to harmonised performance measurement"), as it has potential implications for how it is accounted for, and whether a harmonised performance assessment approach is possible, or desirable, in such context. Secondly, given that accounting devices for sustainability and circular economy proliferate, this thesis seeks to understand how city initiatives navigate this multiplicity of devices and how they account for sustainability performance in practice (Article 2: "Accounting for sustainability performance in cities via tinkering and bricolage"). This is particularly important as global frameworks, such as Sustainable Development Goals (SDGs), attempt to prescribe a one-size-fits-all approach to sustainability performance measurement that is incompatible with approaches advocating for a co-development of performance accounts. Lastly, to answer the overarching research question, this thesis explores how performance indicators are created vis-à-vis the development of a shared vision of a circular city (Article 3: "Construction of performance indicators for a circular economy and its

relation to a city action net"). The thesis is supplemented with an additional article ("Assessing and managing the impact of COVID-19: a study of six European cities participating in a circular economy project"), which I co-authored with my primary supervisor during the COVID-19 pandemic. Adopting a governmentality lens, we explored how performance indicators contributed to making COVID-19 calculable and manageable by the cities. The article is included in Appendix 1, as its contributions and theoretical framework are outside the core scope of this thesis; however, it can bring an interesting perspective on the roles and practices of performance accounting in city initiatives, particularly in times of crisis.

In addressing the overarching research question, I drew on a conceptual toolbox based primarily on actor-network theory (ANT; Latour, 1986, 1987, 1994, 2005), which allowed me to better understand accounting change by focusing on how various concerns are translated within centres of calculation and what happens when accounting devices "travel" to different contexts (Justesen and Mouritsen, 2011). I collected the empirical material from a large-scale EU Horizon 2020 project "REFLOW" focused on circular economy transitions in European cities, which provided funding for this PhD project. With six participating cities, each exploring circular economy solutions with a different blend of local partner organisations, the EU project constituted a context, where collaboration and multiple values of various actors in city initiatives were particularly visible. In this setting, this thesis employed a case study approach (Stake, 2000) as it enabled to explore and understand how performance accounting practices developed, evolved, and stabilised in a collaborative initiative context and how the phenomenon and context mutually influenced each other (Zawawi and Hoque, 2022).

This thesis is organised as follows: First, relevant literature is introduced to situate this thesis within the scientific debates it contributes to. Second, the empirical case of the 'REFLOW' project is presented, followed by methodological considerations relevant to the thesis overall. This is followed by the three articles constituting the main body of this thesis.

Lastly, the articles are tied together in an overall discussion, which also concludes the thesis with a reflection on the limitations and possibilities for future research.

Literature review

This thesis takes an interdisciplinary approach to investigating performance accounting in collaborative initiatives in cities. It draws on and consequently contributes to two strands of research under the accounting umbrella, that is public sector accounting and accounting for circular economy. Key debates in these fields are discussed in the following section of the thesis. First, public sector accounting literature shines light on the broader context of public sector reforms, such as New Public Management (NPM; Hood, 1995) and New Public Governance (NPG; Almqvist *et al.,* 2013), which led to new ways of management and organizing of public life, as well as on the roles and uses of performance measurement therein. As this thesis recognises cities as contexts whereby collaborative initiatives are frequently practiced and are particularly visible, the emerging area of studies on accounting for the city (Lapsley *et al.,* 2010) is also introduced and discussed. Secondly, accounting for circular economy (Wishart and Antheaume, 2021), although a nascent field of research within accounting, can provide a foundation to understand the complexities and tensions that accounting for circular economy performance in collaborative initiatives can entail. As the literature on accounting for circular economy is still relatively scarce, the articles in this thesis also draw on sustainability accounting literature; therefore, the relationship between the concepts of circular economy and sustainability is also discussed in this section.

Accounting in public sector

Public sector accounting has a long history that is closely related to the fluctuations in the political and social environments over time (Van Dooren

et al., 2015). Consequently, early research on public sector accounting emerged within different disciplines, such as public administration studies, political science, financial and management accounting, sociology, organisation studies, and legal studies (Steccolini, 2019). The twentieth century alone has seen the rise and transformation of several movements that emphasised the need for rationality, performance measurement, quantification, and transparency in public sector: starting with the social survey movement in the early 1900s, through scientific management and cost accounting, to performance budgeting in the 1950s, and NPM in 1980s. All movements relied on a similar understanding of public sector's *raison d'etre*: transforming given inputs into outputs that subsequently result in positive outcomes in society (Van Dooren *et al.*, 2015). They also hoped that quantification of performance would support an ambition to make public sector more productive and impact public servants' accountability. However, while largely fuelled by its predecessors, it was not until the NPM movement that accounting and performance measurement were introduced into public sector far and wide. The NPM reforms resulted in a cultural shift, leading to increased focus on outputs, efficiency, and results control[2] (Hood, 1995). In other words, the logics of quantification and managerialism, typically associated with private sector, were introduced into the public administration (Hood, 1995).

Given the considerable changes to public sector and increased focus on managerialism, accounting, and performance measurement, the NPM movement unsurprisingly coincided with the "golden age" of public sector

[2] NPM was an extensive set of reforms, which resulted in different understanding of accounting roles and practice in public sector. As summarised by Lapsley (2009, p. 3) NPM can be best understood through its seven components, that is (1) subdividing public sector into corporatised units, (2) increased contract-based competitive provision, (3) emphasis on private sector management styles, (4) emphasis on discipline and frugality in resource use, (5) hands-on, visible top management, (6) formal and explicit measurable standards and measurement of performance, and (7) emphasis on output controls.

accounting research (Steccolini, 2019). Indeed, since the 1980s, public sector accounting research has developed into a broad and lively field of scholarly investigation (Steccolini, 2019; Grossi *et al.* 2023). A number of studies emerged, exploring the various accounting reforms and their effects in the particular context of public sector organisations[3] (e.g. Broadbent and Laughlin, 1998; Johnsen, 1999; Arnaboldi *et al.,* 2015; for review see Van Helden *et al.*, 2008 and Anessi-Pessina *et al.*, 2016). Many of them evidenced negative effects of NPM reforms, e.g. on motivation, morale, and behaviour of public servants, not least due to increased intensity of work and its overly bureaucratic character (Arnaboldi *et al.*, 2015). Accordingly, two strands of critique of NPM can be identified in literature.

First, concerns emerged that adoption of private sector practices and tools without reflection on the unique features of public sector context is bound to leave the public sector in an "evaluator trap" (Guthrie *et al.*, 1999). The disproportionate focus on quantification and efficiency, referred to as "accountingisation" (Power and Laughlin, 1992), audit society (Power, 1997), or "tick box mentality" (Lapsley, 2009) results in decreased emphasis on public value provision due to time lost on additional bureaucratic work and the displacement of the primary purpose of the organisation affected (Arnaboldi *et al.*, 2015). Furthermore, adverse impacts of NPM on employee welfare and working environment, including stress, low morale, and increased tensions, have been reported (Arnaboldi *et al.*, 2015). In response,

[3] Public sector organisations offer a particular context for accounting research due to their distinctive characteristics, as identified by Lapsley (1988), including: heterogeneity of organisations and stakeholders, coexistence of multiple rationalities and logics, the scale of operations, ambiguity of goals, multifaceted performance, and the presence of reforms and complex change processes. As new ways of organizing economic activities become more commonplace (e.g. cross-sector collaborations), some of these characteristics become more prominent and additional aspects need to be considered (e.g. role in addressing sustainability challenges and other 'wicked problems'), as they influence the conceptions of accountability and performance (Steccolini, 2019).

a concept of New Public Governance (NPG) emerged, shifting the focus from private sector values to public sector values and from single organisations to networks of organisations (Almqvist *et al.*, 2013). NPG refers to the *"steering, coordination, and use of institutional arrangements formulated in policy-making and implementation processes aimed at the collective interest in a polycentric multi-sectoral stakeholder context […]"* (Antiroikko *et al.*, 2011, p. 3, in: Almqvist *et al.*, 2013). This shift in public management entails changes to the organisational boundaries, accountability relationships, and, consequently, to the management and control systems. Because performance information in NPG context is used mainly for accountability purposes, it may be more comprehensive and elaborate than performance information used for control purposes, as it is under NPM. In the latter context, performance indicators are related to the concept of controllability (Speklé and Verbeeten, 2014), which may not be the case in collaborative initiatives, where stronger emphasis is placed on information's relevance to external stakeholders, even if it is outside the scope of managers or politicians in question (Almqvist *et al.,* 2013). Further research is required into how performance indicators are constructed in collaborative contexts and how these circumstances impact the design and use of performance information systems; these issues are explored in the articles that constitute this thesis.

Second critique towards NPM emerged towards using it both as a research context as well as a conceptual lens in public sector accounting research. According to Steccolini (2019), extensive use of NPM as a conceptual lens at an expense of other, potentially more fruitful, theoretical frameworks risks in under-theorisation of public sector accounting. Additionally, it can create a biased focus on the negative effects of public sector accounting, as accounting reforms under NPM are often seen as a negative force in public sector. In response, moving away from public sector towards the concepts of 'publicness' and public values, which manifest in contexts of co-production and hybrid arrangements, has been suggested as one remedy (Steccolini, 2019). More specifically, studying accounting 'in action'

(Hopwood, 1983; Baxter and Chua, 2009) with lens of publicness and public values to extrapolate more general lessons can be a strategy to liberate public sector accounting research from the 'golden cage of NPM' (Steccolini, 2019). This also requires understanding of NPM, NPG, or the public sector more broadly as the setting of research and applying different theoretical lenses that allow to observe accounting 'at work' in this setting. This thesis agrees with this critique and mobilises theoretical perspectives rooted in ANT and organisational studies, which allow to study accounting 'in action'.

Performance management in public sector

Overall, the aforementioned critiques point towards public sector accounting research potentially entering a post-NPM era and new frontiers (Grossi *et al.*, 2023). Within these new developments, the view on performance measurement and management in the public sector also begins to change, as the accountability dimension shifts from vertical performance of a single organisation to horizontal performance of the network of organisations (Almqvist *et al.*, 2013). Furthermore, it is no longer the public sector organisations that are the context of research, but the new arrangements whereby public/political is intertwined with private/economic sphere (Steccolini, 2019). In this relatively new context for public sector accounting research, it has been recognised that implementation and practices of performance measurement can be challenging (Grossi and Argento, 2022; Killian and O'Regan, 2020; Almqvist *et al.,* 2013). The complexity and increased number of forms of accountability have been identified as factors exacerbating this challenge (Grossi and Argento, 2022; Almqvist *et al.,* 2013) together with diverging interests, values, and objectives of different actors (Zawawi and Hoque, 2022) and difficulties in managing cooperation and coordination (Argento *et al.*, 2020).

In NPM, the role of accounting was fundamental. The NPM reforms have resulted in introduction or increased use of private sector tools, such as: budgetary control, Key Performance Indicators (KPIs), benchmarking,

Balanced Scorecard, Lean Management, and managerial checklists (Arnaboldi *et al.,* 2015). Under the umbrella of NPM, performance measurement in public sector served a similar role as in private sector setting, that is to *"guide civil servants' efforts towards their organisations' objectives"* (Speklé & Verbeeten, 2014 p. 131). In this view, performance measures were used to create incentives that helped align individual goals with overall objectives of the organisation, as well as to provide feedback on the progress towards those objectives and to form a basis for internal and external accountability. Consequently, accounting in this context was practiced at an entity level, supporting the perspective that each organisation can pursue their own self-interest, as the generated results will *"somehow trickle down to the masses and benefit the common good"* (Killian and O'Regan, 2020, p. 3). The understanding and implementation of performance measures under the NPM reforms were thus relatively simple, as they had to reflect only one set of public values – namely the 'product values', implying efficient and effective 'production' of services (Van Dooren *et al.,* 2015).

The role of performance measurement in the collaborative and networked arrangements is said to go beyond its traditional incentive use: *"NPM represents a 'command and control' manner of using performance information, while the function of performance information within networks is mainly to support processes of debate and dialogue among the partners with different competencies, who are dependent on each other but not in hierarchical sense"* (Almqvist *et al.,* 2013, p. 482). Similarly, performance in such arrangements also reflects more than efficiency and effectiveness, extending its dimensions to resound other public values, such as: outputs (quantity and quality), efficiency, service outcomes (e.g. impact), responsiveness (e.g. citizen satisfaction) and democratic outcome (e.g. participation and accountability) (Van Dooren *et al.*, 2015). Furthermore, it can serve as a space for collaborating actors to negotiate and reconcile conflicting values (Grossi and Argento, 2022) or be used in more symbolic, ritualistic ways (Dobija *et al.*, 2019). Therefore, implementation of 'traditional' performance measurement systems, that is those adopted from

private sector, has been found problematic (Zawawi and Hoque, 2022; Grossi *et al.*, 2017) and their usefulness has been deemed limited (Hoque and Adams, 2011).

What remains unclear, however, are the processes and dynamics behind establishing performance measurement practices that would foster collaboration and dialogue and reflect them in the design of performance measures. Networks of organisations that could potentially illuminate such processes, are particularly visible in cities (Brorström *et al.*, 2017) – a context, which in recent years has received increased attention from accounting scholars.

Accounting for a city

As stated in the introduction, a city can be defined as a complex ecosystem, in which resources flow between a multitude of actors, across multiple scales and sectors (Williams, 2019). The resource flow is necessary as cities attempt to meet their responsibility for providing the infrastructure and basic services (e.g. housing, waste management, transportation, supply of water and energy), and for improving the standard of living for their citizens. Since cities offer better opportunities for employment and development, they are increasingly attractive for potential inhabitants, driving the phenomenon of urbanization (World Bank, 2022). The United Nations (2018) estimates that by 2050 approximately two-thirds of the world population will reside in urban areas. This significant increase in the number of city dwellers will only exacerbate the natural resource consumption and waste generation, which are directly linked to the escalating climate crisis. Already now 60-80% of natural resources are consumed and 50% of waste is generated in urban areas (cf. Williams, 2019). Therefore, cities have become a key focus area for action in relation to sustainable development, not least with a dedicated UN Sustainable Development Goal #11 that aims to make cities inclusive, safe, resilient, and sustainable (United Nations, 2015). To that end, cities begun to introduce sustainability strategies (Guarini *et al.,* 2022), exploring

approaches ranging from 'smart cities' (Argento *et al.,* 2020), 'flexible urbanism' (Burdett and Philipp, 2018) or 'circular economy' at an urban level (Parisi and Bekier, 2022).

Implementation of the novel strategies relies on various initiatives and city-wide programs, organised as "*network[s] of organisations, which have to share common goals and information and make use of different tools (Rose and Miller, 1992) that are not always compatible […]"* (Brorström *et al.,* 2018, p. 193). The success of such initiatives requires complex investment decisions and effective management, which, in turn, rely on calculative practices (Bourmistrov and Mouritsen, 2022). In particular, the focus on generating and using performance information for city management has been increasing, whereby *"governments use performance measurement systems as tools to direct or reorient the development of smart cities, in order to reach desired goals, attempting to connect responsibility with calculation"* (Grossi and Trunova, 2021, p. 2). Indeed, extant research confirms that in the case of cities, performance indicators can have multiple roles, some of which are similar to their roles in private sector, namely: monitoring progress towards pre-defined goals and objectives, informing planning and decision-making, or assessing and benchmarking conditions (Klopp and Petretta, 2017). They also play a legitimizing role by introducing a perceived objectivity behind specific decisions made (Klopp and Petretta, 2017; Brorström *et al.,* 2018). Performance measurement in cities can also serve roles beyond that, if introduced via systems that promote public participation, stimulate dialogue and debate, and support information flows between city stakeholders (Almqvist *et al.,* 2013). Given that collaboration has been deemed essential for the development and introduction of new strategies in cities (Grossi and Trunova, 2021), performance information in city settings should be generated and used to improve the outcomes of the collaborative efforts (Almqvist *et al.,* 2013). Moreover, if the strategies are to be co-developed, the numbers supposed to reflect this co-development should also follow suit (Bourmistrov and Mouritsen, 2022). However, the literature indicates that such development and use of performance information is an ideal yet to be reached, rather

than a reality. Evidence suggests that although numbers can help to govern cities, it is a problematic endeavour (Argento *et al.,* 2020; Brorström *et al.,* 2018). This can be due to the complexity of the city ecosystems, which host multiple stakeholders with inherent, often irreconcilable differences (Grossi and Trunova, 2021), as well as due to the dependence on known accounting systems and calculative elements which effectively limit the dialogic potential of numbers (Aleksandrov *et al.,* 2022). A study of accounting for a city project in Rome indicated that the multitude of actors and actions required for successful execution even of a single project made traditional accounting mechanisms nearly obsolete (Czarniawska, 2010). Therefore, further research can help extend the understanding of how performance information can be co-developed in cities and what accounting mechanisms are in use to serve the collaborative ambitions.

Accounting research, particularly public sector accounting research, has already turned their attention to study cities – an interest that was exemplified not least in the special issues of Accounting, Auditing, and Accountability Journal: first titled "Accounting for Cities in the 21st Century" (Lapsely *et al.,* 2010) and second "Accounting for the Circular Economy within Cities" (Parisi *et al.*, 2020) that is still ongoing at the time of submitting this thesis. As demonstrated in this section, this growing interest can be partly attributed to the potential impact that improvements in city functioning can have on the lives of the people living therein (Brorström *et al.,* 2018) and on global sustainability (Williams, 2019), as well as to the pertinent role of accounting and calculative practices in city management (Lapsely *et al.,* 2010; Bourmistrov and Mouritsen, 2022). As cities turn to concepts such as circular economy to increase their overall sustainability and become 'future-proof' (Prendeville *et al.*, 2018), the need for cross-sector collaboration and establishment of networked initiatives intensifies, thus increasing the chances of new accounting practices to emerge.

Accounting for circular economy

Circular economy is hardly a new concept; however, it is yet to be fully explored in the accounting field (Arjaliès *et al.,* 2023; Wishart and Antheaume, 2021). Current interdisciplinary literature encourages the use of accounting practices, where particularly various frameworks or specific indicators are suggested to aid decision making and allow for monitoring and benchmarking (Sassanelli *et al.,* 2019; Saidani *et al.*, 2019). Other approaches include developing a single framework to embrace and monitor all aspects of circular economy (Elia *et al.,* 2017; Cagno *et al.,* 2023). Most of the extant research relies on literature reviews and conceptualising different approaches to circular economy accounting. Therein, much attention is paid to the environmental aspect of circular economy, that is measurement of material flows and their interpretation in terms of environmental impact. Further studies into circular economy accounting practices have been encouraged not least to address issues such as cooperation, innovation, and networked relationships (Wishart and Antheaume, 2021). To discuss the current literature on circular economy accounting in more detail, this section begins by introducing the concept, its implementation on city level, and its relationship to the concept of sustainability.

Introduction to circular economy

"All in all, the challenge ahead towards a preventative and regenerative eco-industrial development (Geng et al., 2014a) is not a 'more of the same' approach, calling for increased implementation of 'green' technologies, but instead requires a broader and much more comprehensive look at the design of radically alternative solutions, over the entire life cycle of any process as well as at the interaction between the process and the environment and the economy in which it is embedded, so that the regeneration is not only material or energy recovery but instead becomes an improvement of the entire living and economic model compared to previous business-as-usual economy and resource management." (Ghisellini *et al.,* 2016, p. 12).

The 'business-as-usual economy', based on a so-called 'take-make-dispose' model of production and consumption, has been scrutinised for threatening the existence of natural ecosystems essential for humanity's survival (Ghisellini *et al.,* 2016). Scientific community under the Intergovernmental Panel on Climate Change unanimously and unequivocally concluded that human influence has warmed the atmosphere, ocean, and land, impacted every part of the natural ecosystem, and contributed to the increasingly observed changes in weather and climate extremes (IPCC, 2021). Beyond environmental degradation, 'business-as-usual' has been scrutinised for perpetuating social and economic challenges, including widening inequalities, social vulnerability, poverty trap, poor working conditions, and financial and economic instabilities (Geissdoerfer *et al.,* 2017). In response, various approaches emerged to challenge the existing economic paradigm and replace it with more sustainable system. Concepts such as 'cradle-to-cradle' (Braungart and McDonough, 2002), industrial ecology (Gallopoulos, 2006) or degrowth (Schröder et al., 2019) proliferated, with circular economy receiving considerable attention from policymakers, organisations, and scholars (Merli *et al.,* 2018).

In short, circular economy refers to a model of production and consumption that aims at decoupling economic growth from environmental degradation and natural resource depletion (Williams, 2019), through redesigning material flows in a way that would essentially 'design out' waste. The circular economy approach goes beyond preventing further harm to the natural environment and emphasises also repairing previous damage via restorative and regenerative practices (Ellen MacArthur Foundation, 2013). The material flows within the model are frequently depicted as two mirrored cycles – the technical cycle and the biological cycle – in what came to be described as the 'butterfly model' (Ellen MacArthur Foundation, 2013). Within the technical cycle, materials and products are circulated through processes of reuse, repair, remanufacture and recycling. In the biological cycle, the biodegradable materials are returned to the natural environment to support regenerative processes (see Fig. 1).

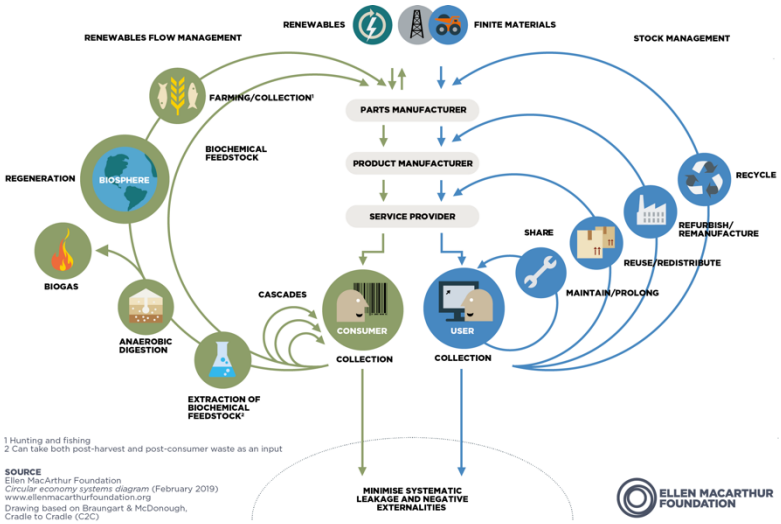


Figure 1. The 'butterfly model' of circular economy. Source: Ellen MacArthur Foundation, 2013.

According to the circular economy principles, products and materials should be circulated at their highest value (Ellen MacArthur Foundation, 2013). This means that any product should first and foremost be kept in circulation e.g. through sharing-based business models or resale, maintained and repaired when necessary. Once the product can no longer be used, it can be disassembled, and its parts can be refurbished or remanufactured and incorporated into other products. Lastly, parts that cannot be remanufactured can be further broken down into constituent materials and recycled. Following the principles of circular economy, recycling is the 'last resort' option as the value embedded in manufactured products and components is lost at that point (Ellen MacArthur Foundation, 2013).

However, as the concept developed and publications and implementation projects proliferated, recycling became the most common component to be associated with circular economy (Kirchherr *et al.,* 2017; Ghisellini *et al.,* 2016). Particularly on national scale, recycling, proper waste management

programs and increased resource efficiency are emphasised as operationalisations of circular economy, which is not fully consistent with the need for decreased resource use, advocated for by circular economy proponents (Ghisellini *et al.,* 2016). In contrast, those adopting a 'systems perspective' in circular economy adoption call for a *"complete reform of the whole system of human activity"* (Yuan *et al.,* 2006, p. 5), stressing the need for more holistic and collaborative approaches.

Although in recent years the concept of circular economy has been receiving increased attention both among scholars and practitioners, its definition has not yet stabilised (Corvellec *et al.,* 2022). In fact, there are vast differences and separations between research communities studying circular economy, for instance engineering and business scholars (Corvellec *et al.,* 2022). The roots of this issue can be (partly) understood by investigating the origins of circular economy. Some trace them to the works of Boulding (1966), who described the need for a closed-loop economy pointing towards the limited amounts of resources available on planet earth and drawing a metaphor of a life on a spaceship. Others link it to ideas of industrial ecology (cf. Wishart and Antheaume, 2021; Ghisellini *et al.*, 2016), which focus on material flows and product life cycles designed to mirror the cyclical operations of natural ecosystems. Further, concepts such as "*cradle-to-cradle design, […], performance economy, biomimicry, eco-efficiency, resilience science, natural capitalism, and cleaner production"* (Korhonen *et al.*, 2018, p. 549) have all been associated with circular economy. More than a hundred definitions of circular economy have been gathered, further substantiating the claim that the concept means different things to different people (Kirchherr *et al.,* 2017). Based on these developments, circular economy has been dubbed a 'vague narrative' (Niskanen *et al.,* 2020), a 'patch adaptable to changing circumstances' (Fitch-Roy *et al.*, 2019) or an 'empty signifier' (Valenzuela and Böhm, 2017). While the ambiguity around the definition could be perceived as its relative strength, one that could position circular economy as an umbrella concept for sustainable approaches to production and consumption, its operationalisation brings to surface unresolved issues

(Blomsma and Brennan, 2017), potentially also challenging the accounting tools and methods used for its management.

Circular economy on a macro level: a circular city

In academic literature, circular economy implementation is investigated and described at three different scales (Ghisellini *et al.,* 2016; Kirchherr *et al.,* 2017):

- micro – referring to single processes, e.g. on company or consumer level,
- meso – referring to eco-industrial parks and industrial symbioses, such as Kalundborg in Denmark,
- macro – referring to city, province, region and nation level.

Although to date researchers have given most attention to the macro scale of circular economy implementation (Merli *et al.,* 2018), most studies are conducted on the national level, with city level still scarcely investigated (Prendeville *et al.,* 2018). At the same time, cities have been recognised as increasingly important for achieving sustainable development and thus the transition to a sustainable society (Loorbach and Shiroyama, 2016). In practice, cities begun incorporating circular economy into their policies and development plans, with examples proliferating in Europe (e.g. Amsterdam [the Netherlands], London [United Kingdom]), Americas (e.g. Belo Horizonte [Brazil], Austin [Texas, United States]), and Asia (e.g. Shenzhen [China]). Cities are particularly interesting for circular economy implementation, not least due to aggregation of products and materials (that is the technical and biological 'nutrients' to be kept in circulation) within city boundaries as well as geographical proximity of various stakeholders whose inputs and collaboration are required to efficiently close the resource loops (cf. Prendeville *et al.,* 2018). Materials, energy, water, and other parts of infrastructure are produced and consumed by actors in the urban ecosystem via manufacturing, construction, shopping, travel, or leisure

activities, among others (Williams, 2019). To achieve the circular city goals – that is, reduction of resource consumption and waste, preservation of ecosystems and natural capital, and eliminating negative externalities – the cities must implement a series of 'circular actions' and 'supporting actions'[4] (Williams, 2019).

Notwithstanding the emerging conceptualisations of actions for a circular city, the issues of implementation – i.e. *'knowing what to do and how to act'* – remain a major challenge for cities due to the manifold issues in public governance (Prendeville *et al.,* 2018, p. 174). This results in circular economy being frequently considered merely as a better approach to waste management or as a synonym to recycling (Ghisellini *et al.* 2016), while its potential for radical innovation in consumption and production patterns is overlooked. Meanwhile, the advancement of circular economy in cities relies on the ability of various stakeholders, including businesses, public sector, knowledge institutes as well as citizens and communities, to collaborate across sectors in pursuit of a collective interest. Indeed, *"the lesson learned from successful experiences is that the transition towards CE [circular economy] comes from the involvement of all actors of the society and their capacity to link*

[4] Looping, regenerating, and adapting are circular actions fundamental to achieving circular processes in the city. Specifically, these can include development of waste-to-energy infrastructure or grey-water recycling (looping actions), creating urban farms, retention ponds and green roofs (regenerating actions), as well as using modular design and flexible buildings to enable the adaptation and renewal of existing infrastructure (adapting actions). Optimization, sharing, substitution and localization are supporting actions, which can be deployed to reinforce the circular strategies. The former refers to increasing efficiency in use of resources via e.g. smart home technologies. Sharing of resources can be achieved via a range of activities, e.g. co-working spaces, car sharing programs, library of things or expansion of public transport grid. Substitution aims at reducing the consumption of finite resources via using renewables, services-based activities, and durable infrastructure. Lastly, localization (e.g. of production and consumption) reduces the need for transportation and thus decreases the associated emissions (Williams, 2019).

and create suitable collaborations and exchange patterns" (Ghisellini *et al.*, 2016, p. 11). The collaboration between stakeholders in cities is often operationalised via various projects, delimiting a specific topic and scope, and also resting on both top-down and bottom-up engagement (Prendeville *et al.,* 2018). Given the differences in perspectives among the stakeholders as well as the blurriness and ambiguity of the circular economy concept (Corvellec *et al.*, 2020, 2022), development of performance measures remains an important task to enhance communication between stakeholders, and account for progress towards circular economy (Wishart and Antheaume, 2021).

Relation between circular economy and sustainability

Circular economy and sustainability[5] are interrelated concepts that share a common agenda of promoting environmental responsibility, economic development, and social equity (Elkington, 1997; Kirchherr *et al.,* 2023). Their study and debate rely on research transcending traditional disciplines, ranging from natural sciences, social sciences, to engineering, and management. Depending on perspective, their understanding can be vastly different or the differences between them can be reconciled (Sauvé *et al.,* 2016).

Sustainability can be understood as a societal objective (Sauvé *et al.,* 2016) and an end goal of achieving sustainable development (Bebbington and Larrinaga, 2014), where the present needs are met without compromising the ability of future generations to meet their own needs (UNWCED, 1987). It explicitly recognises the interconnectedness of social, economic, and environmental systems, and calls for a holistic approach to responsible

[5] Sustainability here also encompasses the concept of sustainable development, as in accounting literature the two have been often studied simultaneously (see Bebbington, 2009; Gasparatos *et al.,* 2009; Bebbington and Larrinaga, 2014). Bebbington and Larrinaga (2014) clarify that sustainability can be understood as *"the end point of achieving sustainable development*" (p. 396).

resource use, waste reduction and societal well-being. Sustainability performance has been also related to issues such as natural resource conservation and emission levels; environmental activities and initiatives; community relations; stakeholder involvement; occupational health and safety; and economic impacts other than those reflected by financial measures (Adams *et al.,* 2014).

As defined before, circular economy can be understood as a model of production and consumption, rather than a societal objective. It places emphasis on material flows, eliminating virgin resource extraction and generation of waste. Particularly on a micro- and meso- level (Ghisellini *et al.*, 2016) this understanding is prevalent; however, on macro level (which encompasses cities, regions, and nations) circular economy reflects also social aspects as it needs to be phased in with societal and stakeholders' interests in mind (Sauvé *et al.,* 2016).

Therefore, in such macro-level contexts circular economy is often discussed as a vehicle for achieving sustainability and sustainable development (Kirchherr *et al.,* 2023). As circular economy on a macro level assumes a redesign of economic and social relations in support of closing material loops, it generates economic, social, and environmental outcomes – that is, it contributes to the three pillars of sustainability (Elkington, 1997). Moreover, both concepts are characterised by lack of clear definition, ambiguity, and diversity of opinions and approaches (Corvellec *et al.,* 2020, 2022; Bebbington and Gray, 2001), which creates challenges for accounting and performance measurement. As such, both are victims to the lack of clarity in terms of 'what accounting looks like' (see Gray, 2010). Both are also seen as a response to 'wicked problems' meaning that they address issues that inherently defy resolution (Bebbington and Larrinaga, 2014), which too is problematic for accounting and performance measurement. Lastly, their pursuit requires collaboration of different actors (Prendeville *et al.,* 2018; Murray *et al.,* 2010), which likely positions them in context of collaborative governance. Therefore, studies of circular economy can illustrate some issues pertinent to sustainability, and vice versa.

The apparent similarities and synergies between the concepts of circular economy, sustainability, and sustainable development warrant further discussion on their nature, meaning, and inter-relationship, particularly in light of accounting. In this thesis' three articles, sustainability- and sustainable development accounting served as a reference and starting point to uncover some challenges in circular economy accounting; conversely, circular economy initiatives served as a case to contribute with further understanding of sustainability accounting.

Performance management for circular economy

Although the fields of ecological economics and cleaner production have in recent years embraced the concept of circular economy, debating its definition and applications (Kirchherr *et al.*, 2017, 2023; Geissdoerfer *et al.,* 2017; Ghisellini *et al.,* 2016), the concept has received far less attention from accounting scholars (cf. Wishart and Antheaume, 2021). A few notable studies have theorised the relation between circular economy and management control systems (e.g. Swensson and Funck, 2019) and explored various aspects of performance measurement of circular economy (Sassanelli *et al.*, 2019; Saidani *et al.,* 2019; Moraga *et al.,* 2019; Pauliuk, 2018). Existing research remains predominantly normative, proposing various tools, frameworks, or typologies of indicators to measure circular economy performance.

Particular focus has been given to the environmental dimension of circular economy, and performance measurement thereof. In their literature review of circularity performance assessment, Sassanelli *et al.* (2019) identified Life Cycle Assessment (LCA) as the most common method and pointed towards a strong orientation of the methodologies studied towards the environmental aspect of circular economy. Their study indicated that, within the literature, assessment methods focus predominantly on material flows (their use in different cycles within circular economy), whereas no methodologies address overall impact of circular economy on all three sustainability dimensions (environmental, economic, and social) (Sassanelli

et al., 2019). Similarly, Merli *et al.* (2018) identified the LCA and Material Flow Analysis (MFA) as key tools mentioned in the literature for driving decision-making and developing specific indicators to assess circularity. The taxonomy of circular economy indicators developed by Saidani *et al.* (2019) is a case in point, where the classification of different indicators is suggested based on the material loops that they relate to, pointing towards a largely environmental orientation. Consequently, as great majority of studies published about circularity performance assessment explores the material flow aspect, emphasising the environmental performance indicators, the idea of circular economy as a predominantly technical subject is shaped in the literature. This, in turn, draws the attention away from social issues and more holistic understandings of circular economy (see Murray *et al.*, 2017). Overall, current approaches to circular economy performance measurement in the literature fail to address multidimensionality of the concept and to incorporate perspectives of diverse stakeholders – which is problematic, given the need for cross-sectoral collaboration and inclusion of all stakeholders in circular economy initiatives, particularly in macro-scale implementation, e.g. in cities (Ghisellini *et al.*, 2016; Prendeville *et al.*, 2018).

As such, further research in accounting for circular economy, and for circular economy performance, is required at least within two streams. On one hand, it has been recognised in the academic literature that the development of specific indicators for circular economy is still at an early stage, even though their development and categorisations can contribute to a deeper understanding of the concept (Merli *et al.*, 2018). With the recent developments of EU Taxonomy, whereby one of the categories is explicitly focused on circular economy (EU, 2020), and of the OECD Inventory of Circular Economy Indicators (OECD, 2021), scientific investigations into the uptake of the new frameworks as well as into the practice of indicator development in collaborative engagements seem to be a timely pursuit. On the other hand, knowing that "*there is more to accounting for CE [circular economy] than developing indicators"* (Wishart and Antheaume, 2021, p. 260) opens up research avenues into various accounting methods and tools for circularity

performance. Overall, more research is required into how circular economy performance can be accounted for beyond only its environmental dimension and beyond a single organisation. To that end, this thesis and its empirical investigation into circular economy initiatives can contribute to expanding this emerging field of research.

Developing the research questions

Cities explore concepts such as 'circular economy' to remain competitive (Kornberger and Carter, 2010) and to mitigate the consequences of the looming climate crisis. As circular economy implementation on a macro level relies on cross-sector collaboration (Ghisellini *et al.,* 2016; Prendeville *et al.,* 2018; Grossi and Trunova, 2021), various multi-stakeholder initiatives emerge to 'co-develop', test and scale circular economy solutions. Such initiatives present themselves as often complex and potentially unstable networks, characterised by a multitude of conflicting interests and visions of urban development. Their functioning and success require not only complex decisions and effective management, but also accounting systems that facilitate information flows and promote public participation, dialogue, and debate (Almqvist *et al*., 2013). To that end, performance measurement has been identified as valuable for collaborative initiatives in providing space for negotiating and reconciling conflicting values (Grossi and Argento, 2022).

However, as different actors present different understandings of circular economy (Kirchherr *et al*., 2017, 2023), the definition of what performance means in such contexts and how it can be accounted for are to be explored. Further questions arise: If circular economy should be co-developed in cities, can performance information be co-developed too? Can city initiatives look beyond the devices that proliferate in academic and practitioner sources, and develop new ways to account for circular economy performance? How can they deal with accounting for performance beyond the environmental dimension of circular economy?

This PhD thesis aims to tackle these issues by exploring the overarching question of: *how is circular economy performance accounted for in collaborative initiatives in cities?* The thesis studies performance accounting practices 'in action' (Hopwood, 1983; Baxter and Chua, 2009), following an EU-wide project focused on development and implementation of circular economy solutions in European cities. By zooming in on the practices of the project and of the cities involved therein, this thesis contributes to both public sector accounting and circular economy accounting literatures with enhanced understanding of how performance is, and can be, accounted for in circular cities.

The case of REFLOW

Given the exploratory character of the overarching research question and the interest in practices and roles of performance accounting, a qualitative approach was deemed an appropriate research methodology (Ahrens and Chapman, 2006). Case study research has for long been recognised as an important approach in qualitative accounting research (Hopwood, 1983; Humphrey and Scapens, 1996), as it helps to illustrate new accounting practices and explore and explain the reasons for their emergence (Scapens, 2004). Moreover, research using case study approaches to explore accounting for circular economy has been encouraged, as currently only limited examples of case studies addressing this topic exist (Wishart and Antheaume, 2021). This thesis, with the underlying theoretical framework rooted in ANT (Latour, 1986, 1987, 1994, 2005), used case studies (Scapens, 2004) seeking to provide in-depth and rich understanding of performance accounting practices emerging in collaborative initiatives in cities.

The case studies were obtained from a three-year European innovation action project called "constRuctive mEtabolic processes For materiaL flOWs in urban and peri-urban environments across Europe" (REFLOW).

The REFLOW project provided funding[6] for this PhD research and the overall project coordinator, Associate Prof. Cristiana Parisi, acted as a primary supervisor of this thesis. The following section introduces the project, describing the context where data was collected.

Introduction to REFLOW

The REFLOW project, funded by a grant from the EU's flagship Horizon 2020 program, set out to "*develop circular and regenerative cities"* (Project Grant Agreement, 2019, p. 8). The vision of REFLOW, as agreed upon by the project members in the project proposal, was to develop circular and regenerative cities through re-configuration of material flows and re-localization of production, with a strong focus on social impact and generating value for society. Upon its completion, REFLOW was expected *"to provide best practices aligning market and government needs in order to create favourable conditions for the public and private sector to adopt circular economy practices"* (Deliverable 1.2, 2020, p. 12). The circular economy solutions were innovated and tested in six European cities, called the 'pilot cities' or simply the 'pilots': Amsterdam (the Netherlands), Berlin (Germany), Cluj-Napoca (Romania), Milan (Italy), Paris (France), and Vejle (Denmark).

The project commenced on June 1st 2019 and was finalised on May 31st 2022. As a beneficiary of the EU Horizon 2020 program, REFLOW was guided by a project contract, called 'the Grant Agreement' (GA), which formalised the relationship between the project participants and the European Commission. The GA described project's objectives and outlined the milestones and deliverables that REFLOW should achieve. Although each city in the project focused on a different material flow (see section 3.2. for more details), the GA ensured overarching strategies and activities to be pursued by all cities. As such, there was a certain level of homogeneity in cities' activities, which allowed to study them all under the project's

[6] Grant Agreement No: 820937.

umbrella. At the same time, there was a great variety in terms of project participants, who ranged from municipalities, non-governmental organisations, academic institutions, small and medium-size enterprises to other private sector companies. Individuals within those organisations represented different professions, nationalities, genders, and backgrounds. The diversity of the participants and of local stakeholders made the project uniquely positioned as a field to study performance accounting in collaborative initiatives.

REFLOW's structures and governance

The project was characterised by a matrix-like structure, with work organised on two levels: 'pilot cities' and 'work-packages'. The work-packages (WPs) referred to the teams of experts supporting pilot cities in the design and implementation of their action plans to foster their transition to circularity. Each WP contributed to the pilot cities with unique expertise; these are presented in Table 1. WPs 1-7 were considered to be the 'building blocks' of the project, given their active role in supporting the pilot cities, whereas WP8 and WP9 focused on overall project and ethics management (Deliverable 1.2, 2020). WPs were composed of various independent organisations from public and private sector, including e.g. universities, social enterprises, consulting firms, and software developers. Furthermore, the various organisations were cross-cutting the different WPs, in that e.g. a leader of WP1 could be a member of WP2 or WP3, and vice versa. The organisations were also expected to collaborate in their support towards pilot cities – in other words, they were expected to engage in co-design and co-creation[7] (facilitated by WP1 as part of process coordination) in pursuit

[7] Co-design and co-creation were understood in the project as part of the overall methodology for development of circular economy solutions. They implied active involvement of the pilot cities and their stakeholders in the whole project lifecycle, that is research and concept generation, iterative prototyping, and validation and impact assessment (Project Grant Agreement, 2019). At the core of REFLOW co-design and co-creation methodology was "*allowing for local, grassroots organisations to*

of innovative solutions for circular economy in cities. With such approach, all participating organisations were important actors required to actively contribute to the solution development in the pilot cities. Table 1 demonstrates the diverse areas deemed important to the development of circular economy solutions in cities and covered by the different WPs in the project.

REFLOW	
Work packages	**Building blocks**
WP1: Business and Design Co-creation	Process Coordination Business and Society
WP2: IT Infrastructure and Tools	Technology
WP3: Circular Engineering	Circular Engineering
WP4: Governance and Urban Strategies of CE	Governance
WP5: Pilots	Pilot Coordination
WP6: Capacity Building and Knowledge Transfer	Capacity Building
WP7: Dissemination, Exploitation and Sustainability	Communication
WP8: Project Management	
WP9: Ethics Requirements	

Table 1. Work-package composition in REFLOW project. Adapted from: Deliverable 1.2, 2020.

present their CE innovative solutions and projects, and for REFLOW WP leaders of WP 1, 2, 3, 4, and 6 to support their development" (Project Grant Agreement, 2019, p. 16). This methodology was in line with the understanding of collaboration in accounting literature, where different actors work together in a communal approach towards achieving common goals (Killian and O'Regan, 2020).

When it comes to governance and decision making, the project was characterised by a flat structure, where both city teams and the WPs were given much freedom to shape their strategies and engagement with each other. The key governance roles were that of project coordinator, steering committee, risk manager, scientific manager, and technical manager. The project was formally accountable to the European Commission for fulfilling the activities and reaching the objectives laid out in the GA.

A 'city' in REFLOW

Pilot cities in REFLOW (also referred to as 'pilots') were understood as local consortia in the aforementioned six European cities, typically composed by members of municipal office, citizens' organisations, makerspaces, and small and medium size enterprises. Apart from organisations formally involved in the REFLOW project, city teams often drew upon and interacted with their own local connections. All cities in the project were actively engaging in co-creation and implementation of circular economy solutions, each of them focusing on one specific material flow (see Table 2).

City	Material flow in focus
Amsterdam	**Textiles:** the pilot explored how textiles are discarded and what can be done for textile waste to be brought back into circulation.
Berlin	**Wastewater heat:** the pilot aimed to reduce CO2 emissions and increase energy efficiency through a digital platform for the optimization of the wastewater heat use.
Cluj-Napoca	**Energy:** the pilot's goal was to reverse the city's increasing energy consumption by introducing more efficient and circular solutions concentrating on district heating and electricity usage.
Milan	**Food:** the pilot focused on connecting the key players in the urban food system and providing them with access to new ways

	of operating in their value chains based of tracking of materials and processes.
Paris	**Events and temporary construction:** the pilot focused on managing (wood) waste generated by major events that take place in the city and incorporating it in sustainable and circular supply chains.
Vejle	**Plastics:** the pilot aimed to develop solutions that would allow for reduction, reuse and recycling of plastics and plastic-based waste.

Table 2. Pilot city composition and focus areas in REFLOW project.

Although REFLOW provided the space and time for knowledge exchange between the city teams in project-wide meetings (e.g. so-called 'co-creation workshops'), pilot cities functioned largely independently from each other. They did, however, interact with the members of different WPs to receive support and guidance in creating innovative solutions to transition from linear to circular economy. As mentioned, the interactions predominantly followed a framework laid out by the GA, which ensured that certain activities were common to all city teams, and that all cities addressed all circular economy levers mobilised in the project.

The pilot cities in the project – local consortia of diverse stakeholders collaborating to develop and scale circular economy solutions – were exemplary cases of how city initiatives came to be understood in public sector accounting scholarship (see Brorström *et al.*, 2018). They functioned as networks of organisations, consisting of REFLOW project partners and stakeholders outside the project boundaries, working towards a shared goal of making each city more circular and regenerative. Their composition different stakeholders with varied interests reflected the complexity of city ecosystems (Grossi and Trunova, 2021). However, the goal of these city initiatives was not fully specified in advance, as circular economy is an

ambiguous concept, having different meanings for different stakeholders (Kirchherr *et al.,* 2017, 2023).

Understanding of circular economy in REFLOW

While the project was guided by the GA that was negotiated and agreed upon by all project members ahead of project launch, many objectives and activities related thereto were left open for interpretation. As the definition of circular economy has not yet stabilised – neither in literature nor in practice (Kirchherr *et al.*, 2017, 2023; Corvellec *et al.*, 2020, 2022) – the core ambition of the project to create 'circular' and 'regenerative' cities had to be revisited numerous times over the course of the project to reach agreement regarding its meaning. The discussions unfolded during regular project meetings, which were a dedicated space for such debate, including the WP meetings, co-creation workshops or steering committee meetings; however, they also emerged in less formal conversations. A survey was also conducted by one of the organisations in the project (leading WP6) to better understand how different REFLOW project members understand circular economy. The results confirmed that circular economy has multiple and diverse meanings; they are discussed in detail in Deliverable 1.2 (2020) of the project and presented in brief in Table 3. This evident multiplicity of understandings of circular economy positioned REFLOW as an interesting context to study how performance is accounted for when objectives are ambiguous and uncertain.

Vision of CE	Change in	Impact
Holistic	Systems	Sustainable future
Behavioural	Culture	Sustainable behaviour
Resource-based	Perceptions	Waste as a resource
Governance-related	Hierarchy	Bottom-up governance
Technological	Effectiveness	Productivity

Business-related	Role of business	Socio-economic contribution of business
Challenge-related	Response to problems	Alleviation of problems caused by globalization

Table 3. Overview of circular economy understandings among different actors in REFLOW. Source: Deliverable 1.2, 2020, p. 90.

Ultimately, a vision of a circular city accepted by all project participants emerged:

"A circular and regenerative city in REFLOW represents an urban system with social and business practices which place equal attention to social, environmental and economic impact; where technology is open and represents a central enabler of positive social and environmental change; where the urban system ensures and supports resilience of social and ecological systems; where governance is collaborative and inclusive; where knowledge is shared, and stakeholders are active and involved." (Deliverable 1.2, 2020, p. 91).

However, even at a point when it was publicly communicated via one of the project's deliverables, it was highlighted that the REFLOW vision of a circular city was constructed in a way that ensures 'interpretational flexibility' in order to provide room for discussion and 'freedom to explore the idea of circular and regenerative city' in order for specific solutions to make contextual sense (Project meeting presentation, 09-10-2020). Moreover, it was also expressed that the vision "*will evolve in line with the same co-evolutionary dynamics characterizing the project"* (Deliverable 1.2, 2020, p. 92). This approach to flexible interpretation and continuous evolution of the circular economy vision presented an interesting context to study performance accounting, as the object of measurement remained ambiguous and uncertain throughout the project. It also created conditions where different understandings of circular economy performance could emerge throughout the project, impacting how performance was accounted for.

Performance management in REFLOW

Performance evaluation of the project was stipulated and broadly described in the GA. According to the GA, at the end of the project's three-year timespan, the pilot cities were to face a performance evaluation as part of the overall project impact assessment (Project Grant Agreement, 2019). The performance evaluation was supposed to be based on three pillars, of which each assumed mobilizing a particular performance assessment device[8] (Ruff, 2021), namely:

1. Identification of outcomes and chains of events producing societal impact based on the Theory of Change (ToC) framework.
2. Measurement of change in outcomes over the project duration via social, economic, and environmental indicators (KPIs), nine of which were specified in the GA for each pilot city.
3. Valuation of change through the use of financial proxies and calculation of the Social Return on Investment (SROI).

The GA provided little guidance for implementation of the proposed performance evaluation framework, besides outlining the responsibilities of WPs in relation to performance evaluation and listing key reporting milestones in forms of written deliverables (reports) to be submitted to the European Commission. This opened up the possibility for the evaluation framework, and the tools within it, to be debated and adapted to project's needs as the project progressed – creating a fertile, laboratory-like (Latour, 1987) research context to observe accounting in action (Hopwood, 1983; Baxter and Chua, 2009). Interestingly, the composition of the performance

[8] As later explained in Article 2 in this thesis, 'devices' refer to "*frameworks, tools, and templates*" (Ruff, 2021) used in impact- or performance measurement (Chenhall *et al.*, 2017). Examples of devices include Theory of Change and its variations (e.g. logical framework), Social Return on Investment (SROI), as well as dashboards and scorecards (e.g. Balanced Scorecard). In essence, devices delineate what information should be included in the impact- or performance analysis (Ruff, 2021).

evaluation framework rested both on qualitative (ToC, SROI) and quantitative (KPIs, SROI) measures, giving space for further exploration and development of qualitative approaches to performance assessments, which are less common in performance management literature (see Van Dooren *et al.*, 2015).

According to the GA, four WPs were involved in performance assessment in REFLOW:

1. WP1 had the overall responsibility to develop and submit deliverables related to performance evaluation and project's impact assessment. WP1 also had the responsibility to oversee the development of social and economic performance indicators and advise the cities on their measurement.
2. WP3 had the responsibility to develop and submit a deliverable on environmental impact assessment. WP3 was also responsible to oversee the development of environmental performance indicators and advise the cities on their measurement.
3. WP5 had the responsibility of pilot city coordination, which in practice entailed also supporting the pilot cities with collection of performance information.
4. WP8 had the responsibility of project management, which in practice entailed also supporting project partners in collaboration with pilot cities and supporting pilot cities with collection of performance information. (Project Grant Agreement, 2019).

Given that it was possible to adapt the performance evaluation framework, the different tools were iterated over time, with the four WPs involved in the process.

The first two measures – ToC and KPIs – were supposed to be implemented and monitored throughout the project duration. The ToC refers to a framework that maps how a given intervention, through a specific set of activities, can result in given outputs, outcomes, and impacts (Ruff, 2021). The contents of the framework were iterated by each pilot city

approximately every six months in a process facilitated by WP1, with a goal to document the changes to each city's action plan, and thus to the chain of events designed to contribute to the city initiative's impact. During the iteration meetings, usually all members of a pilot city consortium were present, and the iterations served as an important space to debate and negotiate the imagined way forward. In that sense, the iteration meetings (and the ToC itself) became a key space where a common narrative was created by the pilot city team members. As the results of ToC iterations were included by WP1 in their deliverables, the ToC also served as a device to externally report progress of the six cities. Different WPs have also appropriated ToC as a device to build upon in pursuit of their own objectives, e.g. building alignment between WPs and pilot cities, or collecting accounts to include in deliverables. Article 2 in this thesis explores in more detail how the ToC as a framework was modified to fit the specific circumstances. An example of a ToC visualization of one of the cities participating in the project is included in Appendix 2.

Similarly to ToC, the KPIs were also supposed to monitor and report the performance of the six cities in the project. While development of the city-specific KPIs was a complex process, studied in more detail in Article 3 of this thesis, the overall use of the KPIs can be best understood by looking at the two distinct sets of KPIs which were used in the project. The first set of so-called 'Proposal KPIs' consisted of indicators developed and agreed upon before project commencement, written into the GA. These KPIs were common for all pilot cities, with minor adjustments depending on the thematic area of each pilot city (e.g. "% of textiles regenerated" vs. "% of plastic regenerated"). An example of a set of KPIs stipulated in the GA for one of the pilot cities can be seen in Table 4.

KPIs	Target
Number of wood and packaging specific city resources identified (materials, infrastructures, etc.)	150
Number of specific wood and packaging streams identified	5
Number of governance / business models developed	5
% wood and packaging regenerated	30%
Overall stakeholder satisfaction with new models	90%
Number of new applications for wood and packaging developed	15
Willingness to pay for regenerated products and materials	75%
Number of local makers and business reached through showcases	1,000
Number of citizens engaged through educational programmes	600

Table 4. KPIs stipulated in the GA for Paris pilot city. Source: Project Grant Agreement, 2019.

As pilot cities dealt with the ambiguity of circular economy and negotiated the common vision of their interventions, these KPIs became contested, considered irrelevant to the local contexts, and outdated given the changing situation. It was therefore agreed that until May 2021 (month 24 out of 36 in the project), the pilot cities could iterate the Proposal KPIs – that is, they could introduce any modifications to their formulation or targets, or, in extreme cases, they could abandon a specific KPI. The proposed changes had to be discussed with WP1, WP3 and WP8. Before month 24 of the project, any adjustments to the KPIs had to be finalised and communicated to the European Commission via WP1's and WP3's deliverables.

The second set of KPIs in REFLOW were the so-called 'Co-created KPIs'. These indicators, complementary to the Proposal KPIs, were agreed upon in a process facilitated by WP1 and WP3, where pilot cities were given the

discretion to select and modify their own indicators. This process is investigated in more detail in Article 3 of this thesis. Similar to the modified Proposal KPIs, this set of indicators had to be communicated to the European Commission via deliverables of WP1 and WP3 before month 24 of the project. At that point, all KPIs were presented together in a 'final' list of KPIs for each city. An example of a final list of KPIs can be seen in Table 5.

KPI	**Target**
Number of governance / business models developed	5
Overall stakeholder satisfaction with new models	80%
Number of new applications to minimise wood waste	10
Willingness to pay for regenerated products and materials	75%
Number of local makers and business reached through showcases	200
Number of people remote from employment engaged through formation	17
Number of stakeholders involved in counselling activities to orient the project direction	7
Number of workshops and makers in the target group that has been reached and/or activated by the project	Training: 5 Tracking label: 4 Data base user: 5 Handbook user: 50
Number of projects that receive financial and non-financial support in form of assets, counselling, facility access, etc.	5
The extent to which the project has contributed to, or inspired, changes in municipal rules and	Qualitative; unitless

regulations to support implementation and "mainstreaming"	
Circular reuse of MDF waste	2 tons (15% of the 2019 baseline)
Numbers of solutions related to waste management and recycling: applicable and replicable	1
Number of wood specific city actors and resources identified (organisation, materials, infrastructure)	150
Number of scoring variables on wood reuse	5

Table 5. Final list of KPIs for Paris pilot city. Source: Deliverable 1.5, 2022.

Lastly, the SROI was used as an impact measurement calculated at the end of the project, that is, once the circular economy solutions were agreed upon and prototyped by the pilot cities. The SROI allowed then to estimate the social impact of circular economy solutions developed by pilot cities. The impact was calculated using financial proxies and expressed in monetary terms. The SROI is an impact measurement device known in accounting literature (see Ruff, 2021); however, depending on its implementation and use in a given project, its elements can also serve a role of performance accounts. As expressed in the REFLOW project impact assessment, *"the SROI is a story about change"* (Deliverable 1.5, 2022, p. 175), where understanding of outcomes and contributions of various stakeholders thereto play a crucial role. It can be conducted in two ways: evaluative and forecast. The former refers to SROI conducted *"retrospectively and based on actual outcomes that have already taken place"* (SROI Network, 2012, p. 8). The latter refers to SROI that *"predicts how much social value will be created if the activities meet their intended outcomes"* (SROI Network, 2012 p. 8). In REFLOW, the latter form was chosen to be conducted, therefore diminishing its role in ongoing performance assessment of the city initiatives. The SROI analysis was conducted in the project for one circular economy solution

selected by each city[9] based on the stage of development and their future potential. In REFLOW, SROI was described as *"an integral component of the final project impact assessment […]. In addition to measuring the social impact of REFLOW, the results of this analysis can be used as a valuable tool for the improvement of activities, communicating impact, and attracting future investment"* (Deliverable 1.5, 2022, p. 178-179). Given its role, SROI was considered in this thesis as one of the devices that could be mobilised in constructing performance accounts.

Case relevance to the thesis

As described in this section, several key issues pertinent to collaborative initiatives and to circular economy have been identified in REFLOW. First, the flexibility given to city stakeholders in developing the vision of circular economy at an urban level resulted in a situation where individual understandings of circular economy can also evolve over time. This flexible approach came in contrast with imposing specific KPIs through the project's GA. Article 1 of this thesis explores this tension, drawing parallels between the GA KPIs and recent attempts to harmonise sustainability performance measurement (Adams and Abhayawansa, 2022).

Second, the GA encouraged pilot cities to look beyond environmental dimension of circular economy and focus also on generating social value. Moreover, the city initiatives consisted of various stakeholders with diverse interests and value orientations, presenting different ideas of what 'good' performance means. With multiple sustainability accounting tools discussed in both academic and practitioner literature (Gasparatos *et al.,* 2009), the city teams could draw on various tools and information to account for

[9] Each pilot city initiative could consist of multiple solutions – e.g. Amsterdam's initiative focused on circular textiles consisted of solutions such as Roadmap on Circular Textiles, Swapshop, Circular Isolation Gowns, United Repair Center, Denim Deal, Booklet, Stadpas, On-Demand Collection, City Wardrobe, or Markthal Innovation Lab (Deliverable 1.5, 2022).

sustainability performance on its different dimensions (environmental, social, and economic; see Elkington, 1997). Article 2 of this thesis explores how multiplicity of performance assessment devices impacted accounting for performance in practice and how various stakeholders' perspectives can be included in the performance accounts.

Lastly, lack of a common understanding of a shared objective and vision for a circular city posed a particular problem for development of performance indicators at a pilot city level. This circumstance and how performance indicators came to be constructed in this context are explored in more detail in Article 3 of this thesis.

As such, REFLOW cities presented themselves as particularly interesting cases to explore how performance is accounted for, with potential contributions to both public sector and circular economy accounting literature.

Methodology

This section begins with a reflection on the overall research process and access to the field. Next, ANT is discussed as the overall 'method theory' (Lukka and Vinnari, 2014), explaining the ontological standpoint and choices regarding research methodology. Lastly, this section describes specific methods used to collect the empirical material that served as a basis for the three articles.

Research process and field access

The PhD study officially begun on December 1st, 2019, exactly six months after REFLOW project kick-off. As the study was directly linked to REFLOW – a project, which Copenhagen Business School was a coordinator of – I entered the domain 'field' (Ahrens and Chapman, 2006) from day one. In fact, my data collection already begun in late 2019, as all REFLOW partner organisations were visiting Copenhagen to discuss the common vision, upcoming activities, and ambitions of the pilot cities in one of the so-called 'co-creation workshops'. Given the immediate access to the complex empirical field that REFLOW was and leaning on my understanding of reality as '*emergent [and] subjectively created*' (Chua, 1986, p. 611), I allowed myself to embrace the exploratory and open-ended interactions with the researched field. Within the first three months of fieldwork, I immersed myself in the project documents outlining the governance and accountability structures, I observed meetings where certain relations between project participants and objects in the project became visible, and I conducted the first round of group interviews with each of the pilot cities to learn about their understanding and vision of circular economy in their cities. In these three months, observations were conducted in person at Copenhagen Business School and during field visits in Vejle (December 2019) and Amsterdam (January 2020), as well as online, as a great deal of work was carried out remotely due to the geographical

spread of project participants. At this stage, I considered my role to be of a *participant* (Scapens, 2004) –my research agenda was disclosed to the REFLOW members and I was accepted as a project member, conducting small tasks alongside my CBS colleagues and other organisations working in the project.

After around three months of the study, the first case of COVID-19 was confirmed in Denmark, and soon thereafter the government introduced a full lockdown. Although REFLOW was well positioned to carry out both the administrative and the collaborative tasks online, as it had done before, the pandemic, the restrictions, and the uncertainty that came with it had a considerable impact on the project and on this PhD study. The possibility of developing and testing circular economy solutions in the pilot cities begun to be questioned. Activities had to be cancelled, revised, or postponed. A risk assessment framework was introduced and, together with performance indicators, it contributed to making COVID-19 calculable and manageable by the cities – a case that we explored in more depth together with my thesis supervisor (Parisi and Bekier, 2022). At this specific point, the data collection turned to observations and interviews geared to better understand how performance indicators, and accounting in general, can play a role in definition and interpretation of programmes in management of ongoing crises. The resulting article, which was published in the Accounting, Auditing and Accountability Journal, can be found in Appendix 1.

As there was no way of knowing when the restrictions would be lifted, I attempted to navigate the fully digital reality of research by continuing to observe meetings, workshops, and other interactions as they unfolded online. Even before the pandemic, online videoconferencing services, such as Zoom, were recognised as valuable research tools due to their perceived user-friendliness, improving research convenience and cost-effectiveness (particularly for research conducted over a large geographical spread), and the option for meeting recording and other data management features (Archibald *et al.*, 2019). During the pandemic, however, the virtual realm

became the 'natural' work environment for the project's participants, and as such its use went beyond serving as a mere research tool. Observing such work environment required some adjustments to accommodate for different needs and preferences (e.g. in terms of online tools used), addressing technical issues (e.g. poor video or audio quality), and dealing with the so-called "Zoom fatigue", that is feeling drained by long time use of videoconferencing (Santana *et al.*, 2021). Most importantly, ethical issues – not least of privacy – had to be addressed; fortunately, online videoconferencing services, such as Zoom, enabled features to ensure informed consent to data recording and storage (Archibald *et al.*, 2019). The recordings of virtual meetings and workshops provided an opportunity to revisit the observed situations and analyse them with attention to details such as tone of voice or body language (Archibald *et al.*, 2019; Santana *et al.*, 2021) and with a different degree of understanding of the field. This opportunity contributed to developing 'thick descriptions', which are a key feature in qualitative research (Parker and Northcott, 2016).

When the specific topic of my research begun to crystallise towards accounting for circular economy performance in collaborative initiatives, my role shifted from a participant to a *facilitator* (Scapens, 2004). As I saw the potential in observing how city teams co-develop performance indicators and how they construct performance accounts that reflect their different (and multiple) understandings of sustainability, I moderated the meetings related to these processes. Particularly important for me in these interactions was to not provide any solutions or impose any course of action on the participants, which is what differentiates facilitation role from action research (Scapens, 2004). My approach was to bring up the guiding points regarding performance assessment from the project's Grant Agreement and allow the participants to find their own solutions.

In September 2021, the situation was stable enough to resume travel and thus field visits could be conducted. Taking advantage of this possibility, I visited the REFLOW pilot cities of Amsterdam (September 2021) and Milan (November 2021) and collected data during a 3-day conference and

project meeting that took place in Copenhagen (March 2022). Outside of the field visits, I continued the data collection via observations of online meetings and via interviews with project participants.

As the field engagement begun immediately at the start of my PhD studies, initial observations coupled with relevant literature reviews inspired the development of specific research questions and selection of 'method theory' (Lukka and Vinnari, 2014). Although each article mobilised concepts that were deemed most useful to approach a given research question, the overall research approach was rooted in ANT (Latour, 1986, 1987, 1994, 2005) which further influenced methodological choices.

Method theory – Actor Network Theory

Various method theories[10] have been used to study public sector accounting, ranging from NPM, through governmentality, institutional theory, to ANT (Lapsley and Miller, 2019). Based on the initial fieldwork and observed issues, which subsequently turned into research questions, ANT was chosen as a theoretical framework with a potential to address them and deliver some explanation (Lukka and Vinnari, 2014). However, as the study progressed, it was acknowledged that *"events in the field may be best explained with reference to multiple theories"* (Ahrens and Chapman, 2006, p. 302) – a tendency visible in recent years in public sector accounting research, where dual or multiple theoretical perspectives are frequently used (Lapsley and Miller, 2019). Therefore, individual articles in this PhD thesis combine

[10] 'Method theory' (Lukka and Vinnari, 2014) refers to a "meta-level conceptual system, or theoretical lens, which originates from another field such as organisation studies or sociology. A method theory offers a vocabulary and syntax, often also substative propositions, which are, at least with adaptations, applicable to another disciplinary domain" (p. 1312). As such, 'method theory', 'theoretical lens' or 'theoretical frameworks' (Lapsley and Miller, 2019) are used here interchangeably, referring to (a set of) theoretical concepts mobilised to offer an alternative perspective on the domain studied and to gather new insights.

ANT with other theoretical concepts, e.g. antenarratives (Boje, 2001; used in Article 1), tinkering (Knorr, 1979) and bricolage (Lévi-Strauss, 1966; both used in Article 2), or action nets (Czarniawska, 2004; used in Article 3). Specific considerations related to the combination of these concepts and ANT are discussed in each article.

As all articles in this PhD thesis engage with ANT, its flat ontology, recognizing agency of both humans and non-humans, and a constructivist approach had a profound impact on the methodological and analytical approaches and on theorizing within this thesis.

First and foremost, in the 'flat space' (Latour, 2005) where no attribution of size or importance is given a priori to social actors, the boundaries of the setting are identified through empirical observations. As Justesen and Mouritsen (2011) explain, "*there is no 'backstage' reality behind the appearances and therefore the dichotomy of appearance/reality is rejected"* (p. 163-164). The key focus is therefore on the visible traces and associations between the actors (Latour, 2005), without ascribing meaning that could exist 'behind the scenes' (Justesen and Mouritsen, 2011). With this flat ontology, Latour avoids positioning the local in the global or the micro in the macro level; on the contrary, *"the macro no longer describes a wider or a larger site in which the micro would be embedded like some Russian Matryoshka doll, but another equally local, equally micro place which is connected to many others through some medium transporting specific types of traces"* (2005, p. 176). Consequently, the focus of empirical investigation is on the networks of elements which gain or lose significance depending on the range of their associations. Any a priori assumptions about the nature of networks or the causal conditions need to be abandoned in the analysis. The flat ontology, where everything is relational, can be a challenging perspective for research, as nothing is ever complete or autonomous and the empirical setting can keep expanding. To address this, ANT can be mobilised at different 'levels of magnification' (Law, 2000 in: Barter and Bebbington, 2013). In other words, a focal point of analysis can be a calculation, a report, an individual, a team, an organisation, or an

industry. The articles in this thesis took either the city initiatives or the REFLOW project as a focal point of analysis.

The focus on associations also provides a distinctive perspective on accounting change and emergence of new accounting practices. In the constructivist approach put forward by ANT, accounting change emerges in a situation where different actants[11], vocabularies, and technologies are *"temporarily linked together at a particular moment in time"* (Justesen and Mouritsen, 2011, p. 164). This also supports the view that accounting systems are not merely implemented or diffused in a given setting, but rather they are constructed (or 'fabricated'; Latour, 1987) with a set of ideas and technologies, constantly shaped and re-shaped until they end up as a 'black box' – that is an undisputed thing that acts as a whole (Latour, 1987; Justesen and Mouritsen, 2011). If a given accounting system or instrument is successfully constructed and 'works' in practice, it is because a sufficient network of allies exists (Latour, 1987). Methodologically, in order to study how accounting systems are constructed, one needs to observe them *"before the controversies involved in its fabrication are closed, before the complexities of its inner working are taken-for-granted"* (Preston *et al.,* 1992, p. 564). The extended and immediate access to the REFLOW project (nearly from its outset) allowed to observe the controversies, negotiations, and trials of different performance accounting systems and devices, before they turned into a 'black box'.

Both humans and non-humans (e.g. tools, instruments, devices) can partake in the construction of networks, as ANT brings all entities into its analytical view. The focus of ANT is on relationship between all entities and how humans and non-humans are 'intermeshed' (Barter and Bebbington, 2013). However, this does not imply that non-human entities have ethical or moral

[11] In ANT vocabulary, an actant is used as a more neutral term than actor, one that resists anthropocentrism and can be used in relation to both humans and non-humans (Barter and Bebbington, 2009). As such, it can refer to an individual, an institution, a technology, or a thing.

agency in their own right (Latour, 2005; Barter and Bebbington, 2013); it is not the entity that transforms actions or practices, but the connections between entities that have the ability to modify action (Latour, 2005). In the analytical approach towards the three articles, this meant recognition that various non-human actants (e.g. documents, Excel sheets, online whiteboards) can be connected and part of the network.

Central to ANT is the concept of translation, defined by Latour as *"displacement, drift, invention, mediation, the creation of a link that did not exist before"* (1994, p. 32). Translation can be understood as a process through which various sites, activities, and interactions come to be represented by a different entity, which can be e.g. a calculation, text, or another network (Robson and Bottausci, 2018, p. 61). In other words, as an effect of translation one thing (e.g. an actor) may stand for another (e.g. a network), and essentially any device or organisation is generated through translation (Law, 1992). For instance, a narrative of circular economy as resource management can be *translated* into a visualization of material flows, where the visualization can be mobilised and 'stand for' the narrative. As such, the use of translation as an analytical concept allows to study what happens when accounting systems or devices travel between settings. Helpful in this analysis are also concepts of 'intermediaries' and 'mediators', where the former refers to actants that *"transport meaning or force without transformation"* (Latour, 2005, p. 39), while the latter refers to actants that *"transform, translate, distort, and modify the meaning of the elements they are supposed to carry"* (Latour, 2005, p. 39). Different accounting technologies, e.g. performance indicators can act as mediators as they come to represent particular understanding or ambition that is reduced to a specific target, and often transformed over time.

Accounting studies have mobilised ANT to understand accounting change and implementation or development of new accounting systems (e.g. Preston *et al.*, 1992; Briers and Chua, 2001; Bruno and Lapsley, 2018). In similar vein, this thesis draws on ANT to observe how various concerns in collaborative settings are translated within centers of calculation and what

happens when accounting devices (e.g. performance assessment devices) "travel" to different contexts (Justesen and Mouritsen, 2011). By drawing on ANT, this thesis looks beyond accounting devices being simply 'diffused' or adopted, and places the focus on "*the work, movement and flow or more simply what actants do*" (Barter and Bebbington, 2013 p. 44). Article 1 provides insight into how translation of different circular economy narratives into visual inscriptions increases their significance; it also shows how narratives can emerge due to existing inscriptions. Article 2 discusses how existing performance assessment methods are adapted, modified, and spontaneously drawn upon in various constellations to translate different sustainability concerns in circular economy initiatives. Meanwhile, Article 3 highlights how human and non-human mediators connect different actions and construction of performance indicators for circular economy.

Data collection and analysis

In line with ANT approach, this study did not rely on a pre-defined set of methods, but rather remained open to various methods and multiple data sources as long as they illuminated new traces of relationships (Barter and Bebbington, 2013; Latour, 2005), particularly related to performance accounts. This was challenging at first, given that these relationships seemed manifold: performance was present in discussions about project objectives and ambitions of each city initiative, it manifested in numbers and narratives, it was visible in diagrams, charts, and pictures. I realised that flexibility in data collection was important to ensure that key actants were followed, but at the same time Bruno Latour's scepticism towards this approach resonated with me: *"How ridiculous is it to claim that inquirers should 'follow the actors themselves', what the actors to be followed swarm in all directions like a bee's nest disturbed by a wayward child? Which actor should be chosen? Which one should be followed and for how long?"* (Latour, 2005, p. 121).

I entered the field open-minded, observed workshops and meetings of different cities and WPs, and participated in formal and informal meetings with the project coordination team. As my fieldwork progressed, in my

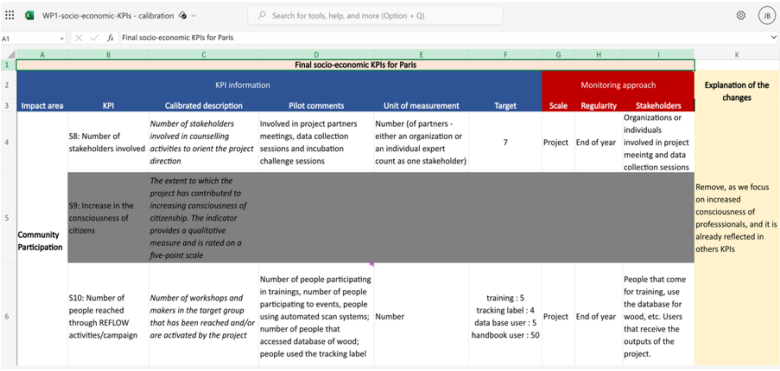
quest to explore how performance was accounted for, where it was visible, and how the characteristics of circular economy and collaboration affected performance accounting, I followed the instances with strongest associations to performance – that turned out to be KPI workshops, Theory of Change workshops, co-creation workshops, meetings of project management with individual city initiatives, and review meetings, among others. As such, the observations were useful in identifying emerging issues and actants, and in tracing the connections between them, but they also helped to identify the boundaries of the setting (Justesen and Mouritsen, 2011). Until the end of my fieldwork, observation remained the most utilised source of data, as it allowed to study "*what actants do"* (Barter and Bebbington, 2013, p. 44) and helped to avoid privileging any particular discourse – a risk that ANT studies overly reliant on interviews often face (Barter and Bebbington, 2013).

For purposes of the articles in this thesis, a collective **311.5 hours of observation** were conducted and documented with field notes, or, where possible and relevant, with recording and subsequent transcription. Majority of the observational data was collected online via Zoom videoconferencing platform, which allowed me to easily record and store data, and return to it when needed. This was particularly useful when selecting data for specific articles, but also to revisit some situations, as some nuances of actions and narratives could be overlooked not least because of the "Zoom fatigue" (Santana *et al.*, 2021). When observations were carried out in person (e.g. during field visits in Vejle, Amsterdam, or Milan; see Section 4.1), hand-written field notes were taken, and any outcomes of workshops were documented with pictures (e.g. where 'impact lenses' later used for performance assessment were discussed and noted down; see Figure 2). The data log of observed meetings, their duration, type of record, and relation to a specific article can be found in Appendix 3. Given the vast amount of recorded data, I followed Robert Scapens' (2004) advice to be selective in transcriptions, which entailed listening to recordings, noting down relevant issues, and transcribing only key sections verbatim.

Figure 2. Examples of offline and online settings for data collection. Left: city team and project members participate in a co-creation workshop, discussing impact lenses from which specific KPIs will be developed. Right: City team participates in an online Theory of Change workshop, drawing connections between activities, outputs, outcomes, and KPIs. The screenshot is taken during a Zoom call; participants' pictures are hidden for privacy reasons.

In addition to observations, various documents (written documents and visualizations) that were produced or mobilised in the project were also collected for analysis. These included, for instance, formal documents (GA, project deliverables, meeting minutes), Excel sheets with KPIs iterations, boards in online collaboration tools (such as Miro), and informal communication (e.g. via e-mail or MS Teams). As a project participant, I had access to all documentation and online collaboration tools, as they were stored on common cloud-based platforms. If a particular text or visualization was only included in a presentation given by another project member, I took a picture or asked for it to be forwarded by email. It was important for me to observe and follow the documents as some of them were important inscriptions (Latour, 1986), translating the idea of circular economy performance. I knew from ANT that inscriptions can be manifold – maps, drawings, legal texts, and files (Latour, 1986), accounting statements (Burchell *et al.,* 1985), or performance measures (Dambrin and Robson, 2011). Focusing on inscriptions was important as they are known to carry 'traces' and create certain visibilities upon which it is possible to act (Robson and Bottausci, 2018). Inscriptions can travel between settings; they be superimposed, reshuffled, recombined, and summarised (Latour, 1986). As they are acted upon, they also modify the meaning they are supposed to

carry. Some of the documents (e.g. GA, Theory of Change board, KPI iteration sheets) turned out to be important inscriptions and key actants in the project, and tracing their movements allowed to observe translation (Latour, 1987).



	A	B	C	D	E	F	G	H	I	K
1	Final socio-economic KPIs for Paris									
2	KPI information						Monitoring approach			Explanation of the changes
3	Impact area	KPI	Calibrated description	Pilot comments	Unit of measurement	Target	Scale	Regularity	Stakeholders	
4	Community Participation	S8: Number of stakeholders involved	*Number of stakeholders involved in counselling activities to orient the project direction*	Involved in project partners meetings, data collection sessions and incubation challenge sessions	Number (of partners - either an organization or an individual expert count as one stakeholder)	7	Project	End of year	Organizations or individuals involved in project meeintg and data collection sessions	
5		S9: Increase in the consciousness of citizens	*The extent to which the project has contributed to increasing consciousness of citizenship. The indicator provides a qualitative measure and is rated on a five-point scale*							Remove, as we focus on increased consciousness of professsionals, and it is already reflected in others KPIs
6		S10: Number of people reached through REFLOW activities/campaign	*Number of workshops and makers in the target group that has been reached and/or are activated by the project*	Number of people participating in trainings, number of people participating to events, people using automated scan systems; number of people that accessed database of wood; people used the tracking label	Number	training : 5 tracking label : 4 data base user : 5 handbook user : 50	Project	End of year	People that come for training, use the database for wood, etc. Users that receive the outputs of the project.	

Figure 3. Example of collected documentation - an Excel sheet, where socio-economic KPIs were 'calibrated' by one of the pilot cities.

Lastly, data was collected through various types of interviews. During observations, I conducted ad-hoc, unstructured[12] interviews (Brinkmann, 2018) to better understand what project participants were doing, clarify things or issues they referred to during meetings and workshops, and ask about their actions outside of the situations visible to me. In the aforementioned data log (see Appendix 3), I classified these interviews as

[12] While Brinkmann (2018) uses the word 'unstructured', they also clarify that "there is no such thing as a completely unstructured interview, since the interviewer will have an idea about what should take place in the conversation" (p. 989). Any question asked essentially structures the conversation. However, this is to signify that no preset interview guide was prepared for these conversations, and they were conducted on as-needed basis.

observational data. In addition, I conducted **14 semi-structured[13] group interviews** and **12 semi-structured individual interviews.** At the beginning of the project, I arranged group interviews with each of the six city teams, where I asked about their understanding of circular economy, what issues are related to circular economy in their cities, and what challenges they face in implementation of circular economy. These interviews helped me follow later on different translations of circular economy performance and explore how circular economy influences performance accounting. Next round of group interviews was conducted in fall of 2021, when the cities were done defining their performance indicators. I was asked to conduct these interviews for the project to develop an understanding which tools and methods used in the project were most useful for the city teams; however, the task gave me an opportunity to ask about the various devices tied to the idea of circular economy performance. As with the first round of interviews, I was able to learn what actions are taken beyond those visible in joint meetings and workshops (e.g. in-person meetings with stakeholders to map value flows or agree on specific performance indicators, which I was not able to attend because of travel restrictions imposed due to COVID-19), how various inscriptions act and are acted upon (e.g. how the visualization of Material Flow Analysis was easily inserted into presentations and reports, which often shifted focus towards environmental performance), and which actants are involved. Once the borders opened and travel was allowed again, I took the opportunity to conduct additional two interviews with the Milan city team, where the team "walked me through" the steps taken to construct performance indicators

[13] Semi-structured interview is understood here as a method of interviewing that allows "following up on whatever angles are deemed important by the interviewee, […] rather than hiding behind a preset interview guide" (Brinkmann, 2018, p. 990). The 'interview guide' was prepared before the interviews only to serve as a starting point to the conversation in order to ground it in a topic relevant to my research. Once the interview was ongoing, I tried to avoid imposing any ideas or concepts on the interviewees.

for their city initiative. Lastly, once the project concluded, I conducted 12 individual interviews with different city team members, project managers, and performance assessment specialists in the project.

The group interviews were useful to observe how the different visions of circular economy and interests of various actors played out in a team setting, which is something that could not be observed via individual interviews (Fontana and Frey, 2000). Additionally, the individual interviews were conducted after the project has ended and helped to clarify issues pertinent to specific research interests. All interviews are listed in the data log (Appendix 3) and the interview guides can be found in Appendix 4.

The articles

This PhD thesis consists of three separate yet interconnected articles, whereby each article explores an aspect of accounting for circular economy performance in collaborative initiatives. The articles explore issues of: (1) emerging performance narratives and their relation to a harmonised performance assessment approach; (2) accounting for performance given a multitude of performance assessment devices; and (3) construction of specific performance indicators in contexts characterised by low contractibility. The articles and their respective contributions are presented briefly below, and in full in the following chapters.

1. **Narratives of sustainability performance in city initiatives and their relation to harmonised performance measurement**

RQ(s): *What performance narratives emerge in a collaborative initiative* and *how are they accounted for given a harmonised sustainability performance assessment approach?*

Background: In recent years, the organisation of economic activity, delivery of public services and innovation in 'public sector' are more frequently executed through collaborative, participatory initiatives (Steccollini, 2019), where accounting has potential to represent the multitude of values and interests of diverse stakeholders (Brown, 2009). However, recent debates within sustainability accounting literature point towards increasing interest of practitioners, researchers, and standard-setters in the 'harmonisation' of sustainability accounting frameworks and reporting approaches (Adams and Abhayawansa, 2022). Taking a circular economy initiative in the city of Amsterdam as a case, this study explores how performance is understood and narrated in a collaborative setting, and what implications this may have for harmonisation of sustainability performance frameworks.

Contribution: The study illuminates the multitude and diversity of performance antenarratives reflecting social, environmental, and economic

aspects of sustainability and how they develop over time depending on actors and activities. The diversity and dynamic development of performance anternarratives creates issues for harmonised performance assessment (Adams and Abhayawansa, 2022); granting visibility to all aspects of sustainability can be aided with tools that formalise accounts in narrative or visual forms, such as Theory of Change, Social Return on Investment, mind-maps, and diagrams. The study also pointed out the tendency of favouring antenarratives that can be translated into quantified metrics.

The study contributes to public sector accounting literature by pointing out the potential of investigating emerging performance antenarratives (Boje, 2001) and their translations into *accounts* as an opportunity to study dialogic accounting in practice. It also provides insight into different forms of performance accounting in a collaborative initiative, where what constitutes 'good' performance is not defined top-down but rather by the initiative's participants.

Status: This article is single-authored and the last one written during my PhD studies. It received valuable and positive feedback from relevant colleagues in the field, but it is yet to be submitted for a journal publication.

2. Accounting for sustainability performance in cities via tinkering and bricolage

RQ: *How is sustainability performance accounted for in cities implementing circular economy initiatives?*

Background: Performance assessment inherently rests on the use of devices (Chenhall *et al.*, 2017), such as frameworks, tools and templates (Ruff, 2021). Devices to account for sustainability performance have proliferated both in practitioner and academic sources, with numerous attempts to create one, universal performance assessment tool for sustainability. Given the differences between local city contexts and the multidimensionality of sustainability, the use of a single performance assessment, without local adaptations, seems to be unlikely. This article

explores how city initiatives deal with the multitude of devices and how they account for sustainability performance in practice.

Contributions: This article contributes to sustainability accounting literature by demonstrating the spontaneous, 'patchwork' manner in which performance information is generated and combined as opposed to the conscious selection advocated in the literature (Gasparatos *et al.*, 2009). As the definitions of circular economy and sustainability continue to be debated (Kirchherr *et al.,* 2017; Corvellec *et al.*, 2020; 2022), and these debates may not result in a stable definition, this article reveals how city initiatives create performance accounts that fit their local understanding and operationalizations of these concepts. The study also highlights the usefulness of studying circular economy initiatives as a case of sustainability, as the issues related to sustainability accounting are particularly visible in such contexts. Lastly, the study contributes to the accounting for the city literature by highlighting the role of qualitative narratives in translating and complementing the quantitative measures.

Status: This article is the result of a joint work between myself and my primary supervisor, Associate Prof. Cristiana Parisi. It was presented in a Journal of Public Budgeting, Accounting and Financial Management (JPBAFM) Special Issue Workshop (November 2022) and at a research seminar at Copenhagen Business School, Denmark. It also received direct feedback from relevant colleagues, which was valuable in its development and for which we are grateful. The paper was accepted for publication in JPBAFM in November 2023. The version included in this thesis is the Author Accepted Manuscript (AAM).

3. Construction of performance indicators for a circular economy and its relation to a city action net

RQ: *How are performance indicators constructed for "circular city" initiatives?*

Background: The third article provides an empirical account of how performance indicators are constructed in a 'circular city' context. The

article discusses the circular city context as an extreme case of low contractibility (Speklé and Verbeeten, 2014), where goals and objectives are ill-defined and where actors are unable to predict the likely outcomes of various alternative courses of action. Given the ambiguity of the circular economy concept, as well as the variety of stakeholders required to develop circular economy solutions, this article seeks to understand *whether* and, if so, *how* objectives are formulated in such settings, in order to further uncover how performance indicators are constructed in relation to this process.

Contributions: This study contributes to the accounting literature focusing on cities (Lapsley *et al.,* 2010; Argento *et al.,* 2020) by enriching the extant understanding of how city initiatives construct performance indicators in situations of low contractibility. To that end, the paper adopts a perspective of an action net (Czarniawska, 2004; 2010) to illuminate how the development of circular economy vision and specific solutions is organised in the city, and how the performance indicators are constructed in relation thereto. By adopting this theoretical lens, this article reveals the co-constitutive relation of the two processes, uncovering the connecting points through which they are knotted together (Lindberg and Czarniawska, 2006).

Status: This article is the result of a joint work between myself and my primary supervisor, Associate Prof. Cristiana Parisi. It is the first one drafted and thus it was circulated most during my PhD studies and received most feedback. It was presented at the 13th EIASM Conference on New Directions in Management Accounting (Lisbon, December 2022); the EAA 28th Doctoral Colloquium in Accounting (Bergen, May 2022) and various seminars (Copenhagen Business School, Denmark; University of Innsbruck, Austria; University of Burgos, Spain). In May 2023 the article was accepted for publication in Accounting, Auditing, and Accountability Journal (AAAJ). The version included in this thesis is the Author Accepted Manuscript (AAM).

Article 1

Narratives of sustainability performance in city initiatives and their relation to harmonised performance measurement

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Abstract:

Purpose: Recent debates within sustainability accounting literature show an increasing interest in the 'harmonisation' of sustainability accounting frameworks and reporting approaches. This study explores how performance is understood and narrated in a collaborative initiative, characterised by diverging interests and objectives among collaborating actors, and what implications this may have for harmonised approaches to sustainability accounting.

Design/methodology/approach: This study draws on narrative theory and Actor-Network Theory to observe and trace the emergence and interaction of different performance narratives as they unfold in a circular economy (CE) initiative in Amsterdam.

Findings: The study finds that the multitude and diversity of performance anternarratives creates issues for harmonised performance assessment. It suggests that granting visibility to all aspects of sustainability can be aided with tools that formalise accounts in narrative or visual forms. The study also points out the tendency of favouring antenarratives that can be translated into quantified metrics.

Originality/value: The study demonstrates the potential of investigating emerging performance antenarratives and their translations into accounts as

an opportunity to observe dialogic accounting in practice. It also provides insight into different forms of performance accounting in a collaborative initiative, where what constitutes 'good' performance is not defined top-down but rather by the initiative's participants.

Keywords: performance measurement, harmonisation, sustainability accounting, antenarrative, circular economy, collaborative governance

Paper type: Research paper

Introduction

The landscape of sustainability performance assessment has been rapidly developing and changing, with numerous approaches being suggested for various types of organizations and different aspects of sustainability (Gasparatos *et al.*, 2009). With different approaches proliferating, a debate emerged on whether sustainability performance assessment and reporting should be 'harmonised' (Adams and Abhayawansa, 2022). Some scholars attempt to create a single, universal performance assessment tool for sustainability (e.g. Cagno *et al.*, 2023). However, these attempts can be problematic as sustainability is an ill-defined concept (Bebbington and Larrinaga, 2014; Bebbington, 2009) that addresses the 'wicked problems' of our times (Bebbington and Larrinaga, 2014), which makes development of solutions uncertain and constantly evolving. This uncertainty and lack of common definition of the concept lead to local adaptations of sustainability performance frameworks, which has been seen not least with the example of Sustainable Development Goals (Sobkowiak *et al.*, 2020).

This issue of harmonising performance measurement of sustainability is further exacerbated in public sector context, where public sector organizations (PSOs) increasingly engage in collaborative, multi-stakeholder partnerships. 'Collaborative governance' (Grossi and Argento, 2022) is particularly visible in cities, as multiple organizations, including PSOs, work together in pursuit of a common agenda. The citizens are increasingly involved as well to ensure relevance of the solutions and generation of public value (Brorström *et al.*, 2018; Grossi and Argento, 2022). Where collaborative governance is present, performance assessment approaches may take new forms (Almqvist *et al.,* 2013; Grossi and Argento, 2022), becoming more "*attuned to a diversity of stakeholders' values and interests"* (Brown, 2009, p. 317).

Throughout the years, measurement of performance has developed in direction that reflects multidimensionality of activities and their impacts – for instance, from financial and market-based measures to non-financial

measures, such as balanced scorecards (Kaplan and Norton, 1996). However, this development is built on the definition of performance as the organization's ability to attain goals (Corvellec, 2003), or, in public sector on the understanding of performance as a ratio between inputs and outputs and outcomes, or, alternatively, the realisation of public values (Van Dooren *et al.*, 2015).

Meanwhile, performance can be understood as 'performance accounts', that is the *narratives* of organizational achievements (Corvellec, 2003). This definition of performance can be mobilized to study sustainability performance in collaborative governance, as various narratives are created by different actors to account for elements of sustainability important to them. To jointly report on sustainability performance, collaborative initiatives should reconcile the different narratives and arrive at a consensus of what sustainability performance means in a given context. Therefore, this study is guided by the following questions: *what performance narratives emerge in a collaborative initiative,* and *how are they accounted for given a harmonised sustainability performance assessment approach?*

To investigate this question, this study follows a circular economy[14] (CE) initiative in the city of Amsterdam, where different actors collaborate to develop solutions for more sustainable textile industry at an urban level. Mobilising the narrative theory (Boje, 2001) and the concepts of *'translation'*

[14] Circular economy (CE) can be broadly defined as *"an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling, and recovering materials in production/distribution and consumption processes"* (Kirchherr *et al.,* 2017). The majority of definitions recognizes CE as promoting sustainable development and aiming to achieve environmental quality, economic development, and social equity (Kirchherr *et al.,* 2023) in line with the most common conceptualization of sustainability (Elkington, 1997). With many definitions and interpretations, CE is recognized as a 'contested' concept (Corvellec *et al.,* 2020). Nonetheless, at its core CE assumes a redesign of economic and social relations and closing of material loops – generating outcomes for economic, social, and environmental sustainability – that will require close collaboration of various actors (Prendeville *et al.,* 2018).

and '*mediators*' from Actor-Network Theory (Latour, 1999, 2005), this study examines the narratives of sustainability performance created by various actors in the CE initiative and follows them as they travel across different settings, interact with each other, and relate to the harmonised performance assessment frameworks. Drawing on both theories allows to explore how the common narrative of sustainability performance is constructed through the storytelling and discursive elements (Vaara and Tienari, 2011) in the collaborative initiative and through the way these narratives are translated (Latour, 1999) by the initiative members and collaborators.

The remainder of this study is organized as follows. First, the literature review presents recent developments in sustainability accounting in relation to harmonising sustainability performance measurement, and public sector accounting in relation to performance measurement in collaborative initiatives. Next, the study elaborates on the narrative analysis and its use in accounting literature. Subsequently, the research setting, and data collection methods are outlined, and findings related to performance narratives in collaborative initiatives are presented. Lastly, the findings are discussed, followed by conclusions and recommendations for further studies.

Literature review

Sustainability accounting and performance assessment

Environmental concerns, such as biodiversity loss, pollution, and warming climate, have caused researchers and practitioners to call for urgent action to ensure a 'safe operating space' for humanity (Lade *et al.*, 2020). The concept of sustainable development, frequently defined as 'the development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (UNWCED, 1987, p. 8), has entered the research agenda, not least for accounting and performance measurement scholars (see Hopwood *et al.*, 2010; Bebbington *et al.*, 2021). Sustainability initiatives have gained popularity at organisational level, promising to contribute to achieving sustainable development. Simultaneously, sustainability performance measurement and reporting

frameworks have proliferated with no agreed worldwide guideline (Adams *et al.*, 2014), creating a complex landscape for organizations to navigate in. The reasons for this multiplicity of sustainability frameworks are manifold.

First, sustainability lacks a clear definition in an organizational context (Bebbington and Larrinaga, 2014; Bebbington, 2009). What constitutes 'good' or 'bad' sustainability performance is unclear and can be contextually defined, since the concept is 'politically plastic' (Bebbington, 2009, p. 189) and can be interpreted in various ways. In public sector context, sustainability performance has been related to issues ranging between: "*natural resource conservation and emission levels; other environmental activities and initiatives; aspects of employment; occupational health and safety; community relations; stakeholder involvement; economic impacts of the organisation other than those financial measures used in the financial accounts*" (Adams *et al.*, 2014, p. 50). Consequently, sustainability performance can refer to different aspects of organisational operations and can be accounted for in different ways. Second, sustainability and sustainable development have been identified as the 'wicked problems' of our times, meaning that solutions require reworking and readjusting as different actions taken can create other manifestations of problems (Bebbington and Larrinaga, 2014). This points to the continuously changing circumstances and the uncertainty of whether sustainability solutions are effective, posing issues for stringent and inflexible performance measurement frameworks. Lastly, sustainability deals with a broad range of issues and scales (Gasparatos *et al.*, 2009), and therefore it requires action and inputs from diverse fields of expertise to address them. At the same time, the issues that need to be addressed are interconnected within larger ecosystems and often cannot be broken down into smaller components. Indeed, for these reasons, mobilising multiple methods for sustainability performance assessment has been suggested (Gasparatos *et al.,* 2009); conversely, local adaptations of global performance assessment frameworks, such as the United Nations Sustainable Development Goals (United Nations, 2015) have also been observed (Sobkowiak *et al.,* 2020).

However, the recent discourse has seen increased focus on 'harmonising' the proliferation of sustainability frameworks, standards, and regulation (Adams and Abhayawansa, 2022), particularly in private sector sustainability performance measurement and reporting. The key elements in the suggested harmonisation of standards include centralisation of sustainability standard-setting and frameworks in one global organisation, prioritising the financial materiality, and ensuring consistent and comparable metrics (Adams and Abhayawansa, 2022). Similar considerations are given to the harmonisation of sustainability performance measurement, where various approaches compete to become the 'unifying' framework, applicable across organisations and contexts (Cagno *et al.,* 2023). While the harmonisation attempts have been discussed in relation to private sector, it is less clear what the implications are for the public sector sustainability efforts (Cohen, 2022). This is particularly important, as public sector works towards the 'common good' (Killian and O'Regan, 2020) rather than the shareholder value (Ball *et al*., 2014), and its sustainability efforts rely on the partnering of diverse actors from state, market, and civil society (Killian and O'Regan, 2020). As such, public sector turns to collaborative governance and dialogic accounting to address diverse public interests (Killian and O'Regan, 2020; Grossi *et al.,* 2023), which can be problematic in light of the harmonisation approach.

Public sector accounting – from single organizations to collaborative governance

Due to its size and scope, as well as its role in shaping services and production and consumption patterns, public sector has been identified as crucial for promoting and supporting sustainability (Kaur and Lodhia, 2019). In comparison to private sector, where primary goal remains to be maximising shareholder value, public sector has a greater responsibility to promote sustainability agenda (Ball *et al.,* 2014). Moreover, while private sector has been criticised for not providing insights into sustainability behaviour at ecosystem and community levels (Bebbington *et al.,* 2007), public sector creates the opportunity to do so (Ball and Bebbington, 2008) given the increasing attention to collaborative, participatory initiatives in

public service delivery. In fact, the public sector context has developed from signifying a range of individual public sector organisations to new, cooperative ways of organising economic activity, deciding on public interests, and delivering public service (Steccollini, 2019).

The collaborative initiatives are particularly visible in cities. Defined as "*complex, dynamic ecosystem through which resources flow between a myriad of actors, across multiple scales and sectors"* (Williams, 2019, p. 2751), cities require collaboration across organizational boundaries (Brorström *et al.*, 2018) as well as citizen participation (Grossi and Argento, 2022) to ensure attainment of common objectives and citizen needs. As such, the organisation of such initiatives is driven by collaborative governance, where a broad range of actors—both individuals and organisations—blend their efforts, resources, and interests to produce public value and services (Grossi and Argento, 2022). In such settings, accounting can become problematic (Steccollini, 2019) and is expected to take new forms and approaches (Almqvist *et al.,* 2013; Grossi and Argento, 2022).

To that end, accounting in general and performance measurement in particular have potential to become more *"attuned to a diversity of stakeholders' values and interests"* (Brown, 2009, p. 317), embracing the citizen-inclusive practices of dialogic accounting (Grossi *et al.,* 2023; Brown, 2009). Dialogic accounting rests on the ambitions of embracing diversity, ensuring participatory processes open also to non-experts, and avoiding 'monetary reductionism' as any situation can be accounted for from different sides and angles (Brown, 2009; Brown and Dillard, 2015). In light of collaborative governance and co-production approaches permeating public sector (Grossi and Argento, 2022; Steccollini, 2019), there is an emerging opportunity for performance measurement to increase representation and inclusion. Dialogic accounting embraces a variety of accounts, which can be both quantitative and qualitative as different groups of actors provide different visibilities (Brown, 2009). However, this goes against the goal of harmonising sustainability performance frameworks and reporting

standards, which is increasingly discussed not only in private but also public sector (Cohen, 2022).

Performance as narratives

The conventional view on performance defines it through the metaphor of production process, whereby outputs and outcomes of activities constitute performances of organisations (Van Dooren *et al.,* 2015). In other words, organisational performance can be measured by comparing actual levels of achievements to set objectives (Corvellec, 2003). However, this definition becomes restrictive in a public sector context, where different public values are addressed and realised, expanding the performance dimensions form outputs and outcomes to efficiency, responsiveness, participation, or citizen satisfaction (Boyne, 2002). Even with this extended definition, the substance of performance remains objectified and idealised, that is treated as a 'near-physical object that exists independently of one's will, representations or understanding of it' (Corvellec, 2003, p. 118).

Meanwhile, given that organisations—and collaborative initiatives that span organisational boundaries—are too complex to directly witness all their 'happenings' (Boje, 1995), performance can rather be understood in terms of the accounts created to reflect it. In that sense, the view on performance shifts from focusing on organisational achievements to focusing on *accounts* of organisational performance presented in form of narratives (Corvellec, 2003). The performance narratives present organisational achievements by singling out specific events, staging a competitive challenge (often expressed by comparison, e.g. between industries, companies, or points in time), assigning a commensurability criterion and measurement procedures. Decisions regarding these elements impact the performance narrative, and thus a variety of performance narratives can exist in the same context: *"there are as many ways of measuring performance as there are intentions and preferences of those producing performance accounts"* (Corvellec, 2003, p. 124). It is therefore important to investigate how performance narratives are created and reconciled in settings where multiple and diverse actors, including citizens, collaborate across organisational boundaries. At the same time, the

multiplicity of performance narratives that emerge in such settings can have direct impacts on the harmonisation efforts of performance measurement frameworks. This study addresses these issues with a theoretical framework inspired by narrative theory (Boje, 2001) and ANT (Latour 1999, 2005).

Theoretical framework

This study explores a construction of a narratives of sustainability performance in a collaborative initiative and their interplay with the harmonised performance measurement framework that is imposed by project management. To that end, the theoretical framework in this study draws on antenarrative theory (Boje, 2001), which allows to draw a distinction between the fragmented, multi-voiced narratives emerging in the initiative and the narrative imposed by the project management, visible in the performance measurement framework.

As discussed by Corvellec (2015), narrative theory is not a cohesive field and many diverse ways to approach a narrative enquiry exist. Particularly relevant to this study is the approach taken by Boje (2001) in which narratives are not yet stabilised or fully articulated. To establish contrast with the traditional narratives, Boje (2001) names them *'antenarratives'*, defined as *"the fragmented, non-linear, incoherent, collective, unplotted, and pre-narrative speculation"* (2001, p. 1). Antenarratives are only parts of the full story, representing the sensemaking that organisational actors do to '*glue it all together'* (Boje, 2001, p. 5) and create a common plot. This, however, is not the goal in itself – multiple antenarratives can coexist, as they provide alternative and sometimes competing versions of organisational identity and change (Vaara and Tienari, 2011). Antenarratives are often told orally; they can be observed and experienced at meetings, coffee breaks, and in informal conversations (Corvellec, 2015). In studying antenarratives, it is thus important to focus on the ongoing storytelling and discursive elements visible in fragments of communication, conversation or text (Vaara and Tienari, 2011).

To study the interactions between various antenarratives, and between the antenarratives and the attempted harmonization of performance measurement frameworks, this study mobilises concepts of *'translation'* and *'mediators'* from ANT (Latour, 1999; 2005). The former is used to illuminate situations of 'displacement, drift, invention, mediation, the creation of a link that did not exists before' (Latour 1999, p. 179), while the latter defines actants which 'transform, translate, distort and modify the meaning or the elements they are supposed to carry' (Latour, 2005, p. 39). In ANT, actants can be both human and non-human, allowing to study the role of devices, such as key performance indicators or technological tools, in the translation of different narratives. Both concepts enable to explore 'contingent processes of change and becoming' (Justesen and Skærbæk, 2010, p. 328) and have been successfully paired with narrative theory in a study on accounts and identity construction (Justesen and Skærbæk, 2010). In this paper however, the concepts of translation and mediators are useful in investigating how different sustainability performance antenarratives emerge and interact in a collaborative initiative.

Research context

In order to explore how various performance antenarratives are created and reconciled in collaborative initiatives in public sector, and how they relate to the harmonized performance measurement, this study adopts a case study approach (Stake, 2000). A circular economy (CE) initiative is deliberately selected for this study as a case, where issues pertaining to sustainability are particularly visible. Broadly defined as *"an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling, and recovering materials in production/distribution and consumption processes"* (Kirchherr *et al.,* 2017, p. 229)*,* CE has been identified as one approach to operationalize the concept of sustainable development (Wishart and Antheaume, 2021). Both sustainable development and CE pursue the goals of environmental quality, economic prosperity, and social equity to benefit current and future generations (Kirchherr *et al.*, 2017), while CE provides specific strategies for redefinition of consumption and production patterns. Similarly, both

concepts are criticized for lack of clarity and vagueness (Gregson *et al.*, 2015; Corvellec *et al.*, 2020), and both are said to require collaboration, as well as inclusive and democratic stakeholder involvement to be successful (Prendeville *et al.*, 2018).

This study thus follows a CE initiative in the city of Amsterdam, developed as part of a large-scale European project funded under the European Commission's flagship Horizon 2020 program. The project aims to *"develop circular and regenerative cities through the re-localisation of production and the re-configuration of material flows at different scales"* (Project Internal Document, 2019). This ambition is realised within a three-year project timeframe through development and testing of innovative solutions that transform the unsustainable practices of the linear production and consumption (the 'take-make-dispose' model) into more circular ones. In Amsterdam, the city team envisioned "to map and re-design the whole ecosystem of textile material flow" (Project Internal Document, 2020). The city team consists of four organisations formally enrolled in the European project, including the municipality (CITY), a technology advisory firm (CONSULT), a non-profit research and innovation lab (LAB) and a cultural and social innovation centre (INNOCENTRE). The latter two organisations also serve as platforms for active citizen engagement and involvement of various stakeholders in co-creation efforts. Additionally, Amsterdam city team is supported by several organizations within the European project, which specialise in different aspects identified as important to the successful development of CE solutions. These include material engineering, governance, technology, business, and process management. Collectively, this consortium of different actors, together with inputs from citizens and other local stakeholders, aims to create more sustainable textile production and consumption patterns in the city of Amsterdam. As such, Amsterdam presents a case of a collaborative initiative in which actors with various visions of sustainability work together towards a common agenda. In this setting, this study observes how the sustainability performance narratives

interact and translate into one another, and how they impact a harmonization of sustainability performance measurement.

Methods

This study mobilises qualitative methods to study the performance narratives and their impact on harmonisation of performance measurement. It relies on different kinds of data, ranging from texts (project documents, workshop outputs, meetings minutes and informal notes), observations of meetings and workshops, to non-structured interviews.

Between December 2019 and June 2022, the author was formally enrolled in the European project studied, which allowed for access to both formal and informal meetings and documents, as well as for conducting short ad-hoc interviews with the project members. Such close engagement with the research field was important for obtaining contextual knowledge and *'interactional expertise'* (Langley et al., 2013, p. 6), which refers to a knowledge needed to understand and communicate about a given domain. This prolonged engagement and in-depth understanding of the field was crucial for following the antenarratives as they developed (Boje, 2001). The majority of the engagement was carried out online, as this was the 'natural' working environment for the geographically dispersed European project and COVID-19 pandemic made international travel impossible. Two field trips to Amsterdam took place – in January 2020 and September 2021, which allowed the author to familiarise themself with the team dynamics, observe the team's work, and perform ad-hoc interviews.

122 pages of text and 146 hours of observation were selected by the author as data points for the analysis based on the topics covered. The ad-hoc interviews were considered part of the observational data, since majority of them took place in relation to a situation observed. Observations were conducted in meetings related to strategy development of the initiative, where different solutions and considerations regarding CE were discussed; in meetings related to the performance assessment, where the collaborating parties discussed the form and content of the information to be reported;

as well as in overall project meetings, where the Amsterdam team members presented their progress, challenges, and reflections. The majority of meetings and the accompanying non-structured interviews were recorded and subsequently selectively transcribed, with key parts transcribed verbatim. When recording was not possible, as during the field visits, extensive field notes were taken and used in the analysis.

The collected empirical material was analysed through qualitative content analysis, by means of two coding rounds. The first coding round was an open coding (also referred to as 'conventional content analysis', see Hsieh and Shannon, 2005), where the data was approached without preconceived categories related to sustainability performance in mind; rather the author allowed for insights to emerge from the data (Hsieh and Shannon, 2005). Through the first coding round, seven sustainability performance antenarratives have been identified related to: citizen awareness and behaviours, job creation, material flows, environmental degradation, economic networks, business models, and economic behaviour. These were subsequently categorised under social impact, environmental performance, and economic performance categories, as they were fitting to the known definition of sustainability performance (Adams *et al.*, 2014). As antenarratives are inherently challenging to study and capture (Boje, 2001), the author relied on triangulating all sources of data to identify emerging patterns (Flick, 2004; see also Vaara and Tienari, 2011). Subsequently, a second round of analysis was performed to examine how these antenarratives interacted with each other and with the suggested performance measurement framework. Here, particular attention was paid to 'following the actors' (Latour, 1987) and identifying the actants and mechanisms that supported the translation of antenarratives. Codes such as 'actant', 'connection', 'transformation' or 'inscription' (Latour, 2005) were used to explore how different mediators participated in formulating, modifying, and constructing sustainability performance narrative in the Amsterdam initiative.

Research results

Similarly to sustainability, CE is characterised by lack of clear definition; or, in other words, a definition so 'plastic' that can contain multiple meanings (Corvellec *et al.*, 2020). In the European project investigated in this study a suggested definition of CE was provided in the so-called Grant Agreement (GA), which was the project contract entered by all participating organisations to guide the project implementation. The GA specified that CE was to be understood as "*an economy that provides multiple value-creation mechanisms which are decoupled with the consumption of finite resources*" (Project Internal Document, 2019), leaving room for contextual interpretation of what 'value' should be created and which various 'value-creation mechanisms' can be pursued. Additionally, the GA also prescribed a specific performance assessment framework that intended to evaluate the city initiatives' progress throughout and at the end of the project. The performance assessment framework was based on three methodologies: (1) Theory of Change, which as a tool is used to identify how a given challenge will be addressed and what is the logical chain of events between the selected activities, outputs, outcomes, and impact (Anderson, 2009), (2) Key Performance Indicators (KPIs), which were specified in the project contract and designed with the intention to be applied across the six different cities participating in the project, and (3) Social Return on Investment (SROI), which is a methodology to calculate the social impact of a given initiative translated into monetary terms (Nicholls *et al.,* 2012). The KPIs set for Amsterdam initiative (and five other cities participating in the project) are presented in Table I.

#	KPI	Target value
1	Number of textile specific city resources identified (materials, infrastructures, etc.)	100
2	Number of specific textile streams identified	10

3	Number of governance/business models developed	5
4	% textile regenerated (current 20% of complete stream)	40%
5	Overall stakeholder satisfaction with new models	80%
6	Number of new applications far textile waste developed	10
7	Willingness to pay for regenerated products and materials	80%
8	Number of local makers and business reached through showcases	2,000
9	Number of citizens engaged through educational programmes	500

Table I. KPIs set in the Grant Agreement for the CE initiative in Amsterdam. Source: Project Grant Agreement, 2019.

As such, the GA attempted to centralise the definition of CE and of its performance and ensure consistent and comparable metrics across the European project, particularly through the use of common KPIs across the participating cities. The reason for using nearly identical KPIs was to monitor the city initiatives in a unified manner, and to provide coherent reporting to the European Commission (EC), which the project was directly accountable to. As the KPIs were included in the project contract, they were difficult to change or overlook, even though participating cities attempted to modify or, in extreme cases, fully remove them. The project coordinator explained in one of the project meetings: *"the GA is a contract, and we suggested these [KPIs] to be put in there. […] I understand that for some cities the KPIs from the GA are too general. But I would be worried if the [EC] reviewers saw a situation where all KPIs from GA were erased. Their job is to have the GA, read it, and evaluate the results."* (Project coordinator, KPI iteration meeting, March 2021). Given their characteristics, the KPIs reflected a harmonised performance assessment approach in the project.

The approach was contested by the city initiatives, who argued for more local, inclusive and context dependent definitions of CE and its performance. One of the organisations in Amsterdam – the LAB – was responsible for development of a "Planning and Evaluation Framework" for all cities in the project, where they argued for a concept of relative change to be applied: *"Understanding [CE] challenges highlights the need for a coordination strategy that supports the practices and tools that facilitate purposeful change as a shared process, rather than a strategy outlining a single solution that forced development, ignoring context and multi-level interactions in real time. Therefore, the starting position of each involved actor should be considered, gauging how much 'the needle can be moved' to align with the purpose of the project"* (D5.1. p. 22). Essentially, the organisation advocated for recognising the differences in the context and 'starting position' of each city in the EU project, while also highlighting the aspects of collaboration and co-creation required in the CE transition, which potentially impact the management and coordination of the city initiatives. Indeed, the "Planning and Evaluation Framework" further elaborates on this relationship*: "the concept of 'relative change' guides the progress of monitoring of the Pilot cities development: by gathering information and refining this information through multiple cycles, Pilot cities produce a progressive scan of their local city context"* (D5.1. p. 30). In subsequent project meetings, where LAB was present, they argued for iterative, flexible approaches to monitor the city initiatives" performance in the project.

This also meant a resistance from LAB towards the centralised and unified definition of CE and its performance in the project, e.g. via the KPIs suggested in the GA. The observed meetings and discussions about how to monitor and assess performance raised questions about how performance was understood by different members of the Amsterdam city initiative. The analysis revealed that a variety of performance antenarratives constructed by different actors became more prominent as the project progressed and new circumstances emerged. The key themes and sub-themes with corresponding examples are presented in Table II.

Themes	Subthemes	Examples
Performance as social impact	Increased awareness; change in behaviours	"*passing through all stages of a behavioural change will be crucial to achieve a long-lasting impact. […] So far, the pilot has developed a campaign consisting of different activities mapped on the behavioural change wheel – with five key steps: (1) learn, (2) engage, (3) situate, (4) change, (5) continue, that are critical to achieve lasting behavioural change"* (Project Deliverable D1.2, p . 21)
	Job creation	*"I remember I said I missed the social part in the KPIs, because if we have the vision to be circular, that means we also need people to work in this field. And to combine what is happening at the moment with the refugees who are coming to cities. Because they are bringing a lot of skills."* (CITY member 1, team interview, 07-10-2021)
Performance as environmental performance	Material flows	*"our goal is to decrease the amount of incinerated textiles, increase the amount of recycled textiles, and create this loop – move from the linear to circular design ecosystem, where we cut out waste from the system"* (LAB member 1, Pilot presentation at project workshop, 11-06-2020)
	Environmental degradation	*"We know all the data on CO_2, sulphur, microplastics, and they all have impact. This could be much more important in the end than to have this figure here that says that we have increased reuse from 10 tons to 12 tons."* (CONSULT member 1, Project workshop, 15-04-2021)

Performance as economic performance	Economic networks; Business models	*"We created the 'Monday Laundry Day', where we brought together 50 stakeholders, and we now understand what they need to achieve 100% circularity. Then we created the Denim Deal, Innovation Centre, United Repair Centre […]"* (CITY member 1, Theory of Change iteration workshop, 09-02-2021)
	Economic behaviour	*To start to rethink your own business is the biggest success… that others started to do this because of our project"* (CITY member 1, interview, 22-11-2022).

Table II. Narrative themes identified in data analysis. Table by author.

Performance as social impact

The way in which the CE initiative and its performance were described by the Amsterdam team, particularly by the members from CITY and LAB, relied heavily on aspects of increasing citizens' awareness about circular economy and consequently changing their behaviours. The success of the initiative corresponded to its ability to influence how people handle textiles, that is whether they repair clothes, sort textiles beyond repair, and purchase second-hand items. Environmental aspects, for instance recycling targets, were sometimes mentioned by project members from these organisations, but the discourse was dominated by the need to change awareness and behaviours of citizens. The understanding of what good performance meant for the initiative was shaped in relation thereto. For instance, when asked about key risks foreseen for the Amsterdam initiative, one of the team members answered that "*the risk is that the citizens don't continue recycling the textiles. Maybe it won't stay a habit, or it won't stay on trend."* (LAB member 1, team interview, 10-01-2020), indicating that the sustainable change in behaviours was an important metric of success for the initiative. The need for citizens to become active participants in the circular economy was

stressed multiple times: *"we close the loop by having the citizens engaged in the process, helping the industry to make the change happen"* (LAB member 1, team interview, 10-01-2020).

The importance of the behavioural change was accentuated by the team, as they mobilised a visual inscription to help with communicating this vision. The inscription, developed by LAB, was referred to as the 'behavioural change wheel' and presented the steps considered as required for a citizen to change their behaviour, namely: "learn, engage, situate, change, continue" placed on a continuous loop. The 'wheel' was used to identify activities that could serve as different entry points to achieve behavioural change among the citizens in Amsterdam. It was also mobilised by one of the team members during the selection of relevant performance indicators. Behavioural change was considered a difficult success criterion to measure, but the steps visualised on the wheel were seen as a way to track it. As expressed by the team member: *"I hope the behavioural wheel change can help us with that [with measurement of performance on behavioural change], to see where the citizens situate themselves."* (LAB member 1, KPI calibration meeting, 31-08-2020).

Increased awareness about CE and sustainability issues has been given a deal of attention in the Amsterdam's initiative, as it was identified as the first step in the 'behavioural change wheel'. Examples of initiatives and potential interventions that could 'raise awareness', 'induce behavioural change among citizens', 'provide citizens with knowledge' and 'enable citizen action' were frequently mobilised in written and oral communications, becoming part of the ongoing storytelling (Vaara and Tienari, 2011). These antenarratives (Boje, 2001) were also linked to the KPIs of Amsterdam's CE initiative formulated in the GA, where good performance was reflected in the number of people reached through showcases or educational programmes, which, for instance, the CE booklet developed by the LAB came to be considered as. However, the antenarratives went beyond the existing KPIs, giving different and multiple accounts of CE performance.

The stories about increased CE awareness were related mainly to citizens, but at times also to awareness among policy makers and industry actors. The key advocate of this perspective was a member of CITY, who considered the efforts in awareness building as crucial to the overall success of the initiative: "*It's already happening, at the start of the project I did a workshop and policy training in [Dutch name], it's a start up residence programme. Because of that workshop a lot of policy makers and buyers were inspired, and now we organized a workshop for buyers. So that is already one milestone. And now we are talking with lot of cities in this region for them to participate in some projects".* (CITY member 1, KPI calibration meeting, 31-08-2020). This aspect of achieving circularity in Amsterdam was so important to CITY, that this team member argued for including specific indicators related to increased awareness in the initiative's set of KPIs, which would reflect the number of people or industry organisations reached during the project. At the end, this antenarrative did not result in additional KPIs.

The narrative of CE performance as social impact lasted throughout the project, sometimes adjusted by different team members to specific aspects of the initiative. At one point, the topic of job creation entered the storytelling in relation to the initiative's performance. The team member representing the CITY expressing their dissatisfaction with lack of relevant KPIs to track it: *"I remember I said I missed the social part in the KPIs, because if we have the vision to be circular, that means we also need people to work in this field. And to combine what is happening at the moment with the refugees who are coming to cities. Because they are bringing a lot of skills."* (CITY member 1, team interview, 07-10-2021). While the antenarrative about job creation, skills development and social connections was visible in team discussions and written reports, the team found it difficult to translate it into specific KPIs:

CITY member 1: *"We can offer the technical and social skills in the integration of the new citizens, and they also bring in new knowledge. We do also put them in contact with people form the MBO [educational institutions], so they can further teach each other more skills. Like what we do now in Makers Unite and House of Denim, etc.*

LAB member 2: *There is a strong social return on investment.*

CITY member 1: *Exactly, as you integrate all the skills into the circular system.*

CONSULT member 1: *Yes, but that is very difficult to put into KPIs."* (Team interview, 07-10-2021).

The descriptions of the behavioural change and raising awareness among citizens and industry actors were particularly dominant in the Amsterdam city team at the beginning of the project. However, they became increasingly supplemented with discussions about activities that need to focus on the environmental aspect of CE – that is, the textile flows in the city. In different presentations, discussions, and written reports there was more emphasis on the amount of textiles that should be reused or the amount of virgin fibres used in production of yarns. For instance, at one of the project meetings, an Amsterdam city team member described a connection between the behavioural change and the material flows: "*what we are trying to create is a loop, where the citizens are the actors that change the dynamics of material flow. […] We want to trigger behavioural change, so that citizens become change makers themselves, and are able to collect more textiles that would reach sorting companies, that would create more raw material for companies to produce with"* (LAB member 1, team interview, 10-01-2020). The antenarrative of CE performance as change in material flows begun to form in relation to the behavioural change narrative and quickly the two became told in parallel.

Performance as environmental performance

Indeed, as the project progressed, the narratives about CE and performance in the initiative begun to focus increasingly on the concept of material flows. The aspects of CE that came up in discussions and documents that the team produced at that time were related to the value chain of textiles, the treatment of textiles, and their lifecycle. In one of the presentations, Amsterdam initiative's goal was described as: *"we need to increase the amount of collected textiles to be brought back into this loop. This will provide feedstock for the recycling industry, which in turn will be able to supply all of us with newly produced products out of recycled resources"* (Project meeting, 9-09-2020).

The attention on material flows became particularly visible after the first Material Flow Analysis (MFA) was conducted for the Amsterdam initiative by one of the organisations that advised the cities in the EU project on material engineering. MFA is a methodology for quantification of flows and stocks of materials in a given system, for instance in a city or a neighbourhood. Once the analysis was conducted for the Amsterdam team, evidence emerged regarding the issues that should be addressed. The results of the MFA gave visibility to the number of textiles entering the city, being consumed in the city, being collected in municipal waste collection, and further handled via reuse, recycling, or incineration. This information provided the Amsterdam team with data-supported arguments for specific interventions, and the team was observed mobilising MFA results on multiple occasions: *"the MFA was fundamental for us, as it started to show us where the issue was. […] We noticed that [the amounts of] incinerated textiles were quite high and [the amounts of] recycled textiles were quite low. So our goal is to decrease the amount of incinerated textiles, increase the amount of recycled textiles, and create this loop – move from the linear to circular design ecosystem, where we cut out waste from the system"* (LAB member 1, Pilot presentation at project workshop, 11-06-2020)

The organisation performing the MFA played a key role in advancing the material flows narrative and focus on environmental performance. As a well-recognised firm in the environmental consulting industry, they enjoyed a high profile in the project and were regarded as highly competent experts in their field. Additionally, the consultants who performed the MFA were located in Amsterdam, with a close geographical proximity to the city team, which helped in establishing a close relationship. The consultants also supported the translation of environmental data gathered during the MFA into the narrative of Amsterdam's initiative. Both in organised workshops and less formal discussions, they emphasised environmental aspects of Amsterdam's initiative by using specialised language, related to e.g. 'feedstock processing' (such as 'sorting based on fractions', 'material recycling', 'compacting' etc.) or 'closing material loops'.

Additionally, the environmental consulting organisation translated the MFA results into a visual inscription (Latour, 2005), which travelled easily between different events, discussions, and presentations. This inscription (see Fig. I.) was mobilised by the city team members on various occasions to provide a foundation for discussing and evaluating proposed solutions and their potential impact.

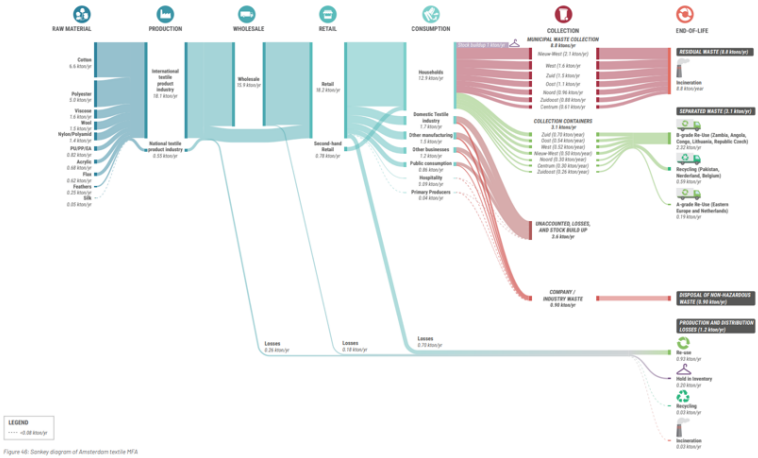

Figure I. Sankey diagram of Amsterdam textile MFA. Source: Project Deliverable D3.1, 2020.

In discussions with Amsterdam team, and particularly with CONSULT and INNOCENTER, specific numbers, e.g. on amounts of textiles collected, sorted, and recycled were turned into goals and success metrics for the Amsterdam initiative. Consequently, they were further translated into additional environmental KPIs. In fact, the availability of data on environmental performance led to more ambitious targets being proposed than what was initially included in the project's GA. In discussing the KPI #4 "% textile regenerated", one of Amsterdam team members suggested looking at other metrics of environmental impact based on the emerging antenarrative of "true environmental cost":

CONSULT member 1: *"One example – in the region of Amsterdam, every year, six million isolation gowns are disposed of. Six million. And one of our initiatives is to replace them with reusable cotton or polyester gowns, which means a huge benefit in terms of environmental improvement. And we calculated the true ecological cost in euros per ton to see the impact. That would be interesting here as a target, to significantly reduce the true environmental cost of using these textiles. We know all the data on CO_2, sulphur, microplastics, and they all have impact. This could be much more important in the end than to have this figure here that says that we have increased reuse from 10 tons to 12 tons. The true environmental impact is what matters. By only replacing the disposable isolation gowns, we can reduce 0.7% of the total CO2 of the Netherlands. And this is part of our legacy.*

Consultant 1: *I think your point about CO2 impact is strong, and that should be something that becomes part of the narrative, not just the legacy. It could be also incorporated into the KPIs to show how well we are doing with cumulative CO2 impacts of project activities."* (Project workshop, 15-04-2021)

Based on the emerging antenarrative focused on change in material flows and overall environmental performance of circular economy, additional KPIs were formulated by the Amsterdam team and included in the final reporting of the city initiative's performance. As such, the antenarratives of performance went beyond what was 'prescribed' by the KPIs suggested in the GA; however, they were so important, and had enough allies, to lead to formalizing the antenarrative in new KPIs (see Table III).

#	KPI	Target value
1	% of textiles diverted from incineration	20%
2	Amount of AMS textiles with a second life (through project initiative)	45,000kg
3	% of reduction in textile waste found in mixed waste	20%
4	CO2 reduction through project activities	2.6 kton

Table III. KPIs added to performance assessment framework of Amsterdam initiative. Source: Deliverable 1.5, 2022.

Interestingly, only one of these KPIs was reached by the end of the project, which indicates that they were not selected to achieve favourable image by reporting positive results. Nonetheless, the prominence of the antenarrative of environmental performance, combined with the relative ease of its quantification, resulted in its formalization in specific KPIs.

Performance as economic performance

In relation to the MFA, an ecosystem mapping was also conducted in the project. In this case, mapping the 'ecosystem' meant an identification of key actions in the value chain required to close the loop from linear to circular textile economy, and subsequent identification of specific actors that can carry out the given action. For instance, one of the initiatives suggested in Amsterdam was to create reusable isolation gowns for healthcare providers, as the current solution (i.e. disposable gowns) at the time was unsustainable and polluting. In this case, the change in the value chain would involve connecting a local manufacturer of multi-use healthcare gowns with healthcare wholesalers, who then sell the gowns to hospitals and other healthcare institutions. From there, a connection is required to a cleaning service, which would also handle maintenance and repair of the gowns. A connection needs to be established between the cleaning service and waste handling facility that can sort out non-reusable textiles and transport them to a local recycling point for mechanical recycling. From there, the loop closes when the recycled materials and fibres reach the local manufacturer of textiles – a supplier of the isolation gown manufacturer.

In the course of the ecosystems mapping exercise, the Amsterdam city team started reformulating the narrative of CE in the context of value chain, including stories about activating relevant actors and developing new connections between them. Subsequently, the development of connections between different actors in the textile industry was discussed as an aspect, where the Amsterdam team and their initiatives can have a big influence:

LAB member 1: "*You can't really* establish *a supply chain.* [Emphasis added] *I mean, you can as a manufacturer of a product. But us? We can only help them connect,*

have them talking and see how they can make this change together. And it's not just entrepreneurs and sorting companies, that's very narrow. It's actually each of the representatives of the steps in the "textile wheel" that we produced.

CITY member 1: *I don't know if you know the textile industry, but it is not about just moving from linear to circular. It is also an industry where actors go all alone. Factory owners, they never share who their clients are or who they are working with. And the change now with circularity is that the industry is understanding that we need partnerships. But that costs a lot of trust and to have confidence in each other. And to get to that change, how can you have confidence if you never talk to each other? To start the conversation is a very big step for the textile industry. And slowly, I see this through our project, because we put all this industry together, that makes already a difference.*

CONSULT member 1: *And these changes are happening, I know there are already two or three groups of companies working together on different aspects of textile industry. And mapping value* [one of Amsterdam's activities in the project – ed.] *is strongly related to entrepreneurial behavior and reasons why people should work together. This is a very interesting and a very important aspect of what we are trying to do. These aspects here* [pointing at the activities listed on the Theory of Change visualisation]*: mapping value, facilitating connections and conversations are the reasons why people work together, and through these the thinking behind our project will then become a success."* (Theory of Change iteration workshop, 30-09-2020).

Consequently, development of connections between actors in value chain was also considered to be an important metric of success, even though it was not reflected in any specific KPI: *"so for example I already do some meetings, I did already some workshops for all the buyers in the Metropolitan Region of Amsterdam […] And the interest for the workshops is growing, and that has never happened before. So because of my role, and my role in [this initiative], it has activated a bigger audience. So that is already a measure."* (CITY member 1, KPI calibration meeting, 31-08-2020).

Similarly to the social and environmental performance narratives, the antenarrative about value chain was translated into a visual inscription that allowed for the story to be mobilised in meetings, presentations, and

reports. The translation took place over a series of meetings, where an online whiteboard tool called 'Miro' was used to iteratively illustrate the connections between actors required to create new, circular business models related to specific solutions, ultimately leading to increased textile circularity in Amsterdam (see Fig. II). Figure II shows an example of stakeholders and connections identified in relation to a specific intervention; in this case, the intervention imagines establishment of 'swapshops' for easy exchange of clothing by the citizens.

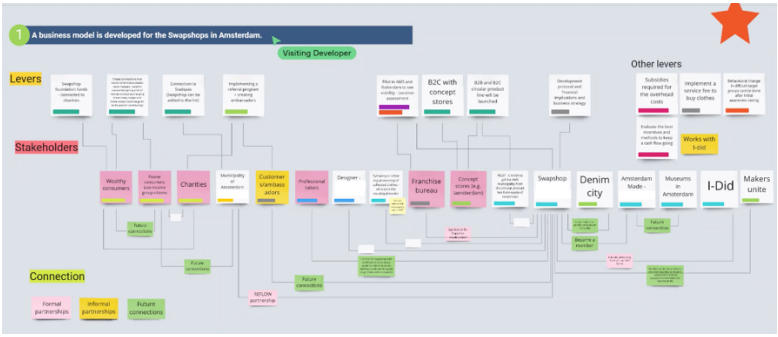

Figure II. Example of an inscription created to visualize stakeholders of a specific intervention and connections between them.

At the end of the project, the narrative of successful performance as establishing new connections within a network of actors was still visible and mobilised by the team members in storytelling about the city initiative. When asked about good performance and achievements of the initiative, one of the team members pointed to the roadmaps developed for changing the value chains: "*there has been something set in motion in the region, and that is what defines the success of our initiative, because we still experience it, that it's present. For instance, there are the roadmaps, the network is created*" (LAB member 2, interview, 22-11-2022).

Additionally, the economic performance narratives were also related to changes in economic activity of existing businesses. As the CE requires

businesses to rethink their current business models and instead challenge the status quo of unsustainable mass consumerism, microtrends and fast fashion (Ellen MacArthur Foundation, 2017), a narrative of good performance related to changes in business activity was also present in the initiative: "*now we can see also with Black Friday, some retailers are not joining Black Friday anymore. To start to rethink your own business is the biggest success… that others started to do this because of our project"* (CITY member 1, interview, 22-11-2022). Although stories like the one told about Black Friday seemed important to the Amsterdam team members, they were not captured by the initiative's existing KPIs as they did not reflect a change in governance or business model of a given organisation. References and stories related to the different business models – among others, the 'circular isolation gowns' described above, or the United Repair Centre established with the help of the Amsterdam initiative – were more frequently brought up in conversations: "*People understood that it was not just talking. We were diving deeper, and we could immediately take action. It was also with repair – for instance, with Makers Unite, we transformed their business model. Together with stakeholders like Patagonia, PFH, they are now setting up this United Repair Centre […]"* (CITY member 1, interview, 22-11-2022). The new business model connects brands that require repair services with Makers Unite, who can mobilise tailors to repair the faulty items. As the United Repair Centre was included in the performance assessment under the GA KPI #3: "*Number of governance/business models developed"*, more information was gathered and developed about it in the initiative.

Discussion

The landscape of sustainability accounting and reporting is constantly evolving, with new reporting standards and performance measurement frameworks proliferating (Gasparatos *et al.*, 2009; Adams *et al.*, 2014; Bebbington *et al.*, 2021), forcing organisations to be flexible and responsive to these emerging approaches. To deal with this proliferation of performance frameworks, standards, and reporting practices, the recent debate in sustainability accounting literature has turned the attention to the

ongoing efforts in their 'harmonisation' (see Adams and Abhayawansa, 2022). The harmonisation approach is based on a pursuit of a single, global standard-setting organisation, prioritising financial materiality, and ensuring a consistent and comparable set of performance metrics used across organisations (Adams and Abhayawansa, 2022). However, this debate is particularly geared towards private sector organisations and their sustainability reporting practices, not least due to private sector being the primary target of standard setting bodies such as Global Reporting Initiative, Sustainability Accounting Standards Board, or the United Nations Development Programme's SDG Impact Standards.

Meanwhile, sustainability accounting and reporting practices are emerging also in public sector, not least due to *"the increased pressure on public sector organisations to improve performance to remain viable in today's competitive and global operating environment and to demonstrate this to external as well as internal stakeholders"* (Adams *et al.*, 2014, p. 47). However, the implications of the ongoing debate on harmonisation are unclear in the public sector setting (Cohen, 2022). Although public sector has historically embraced accounting practices borrowed from private sector (not least in the wake of New Public Management, see: Hood, 1995; Lapsley, 2009), recent studies point towards collaborative governance and dialogic accountability as mechanisms relied on in public sector to address diverse public interests (Killian and O'Regan, 2020; Grossi *et al.*, 2023). The focus on ensuring a diverse, participatory process of creating accounts, openness to non-expert accounting, and avoiding 'monetary reductionism' (Brown, 2009) come in stark contrast to the suggested harmonisation approach and thus the adoption of a harmonised performance measurement framework in the public sector remains uncertain.

This study followed a CE initiative in the city of Amsterdam to explore how performance is understood in a setting where collaborative governance is particularly visible. Specifically, it examined what antenarratives (Boje, 2001) about CE emerged in the initiative, and how they related to the attempt of

harmonising performance measurement in the larger project, which the initiative was embedded in.

The findings point towards the multitude and diversity of antenarratives present in the collaborative initiative. Depending on the actors and on performed activities, the antenarratives of CE performance changed from focusing on awareness and behavioural change among citizens, material flows and environmental impacts, to changes in value chains and in economic activity. As such, the narratives in Amsterdam reflected the known three pillars of sustainability – social, environmental, and economic (Elkington, 1997) – emphasising the necessity of performance measures to account for all three elements, rather than limiting their focus to aspects that can be monetised, as encouraged by the harmonisation approach (Adams and Abhayawansa, 2022). As sustainability accounting frequently deals with delicate issues, assigning only monetary values to them "*can be extremely difficult and, in some cases, inappropriate"* (Cohen, 2022). Moreover, any form of quantification of sustainability performance is also inherently reductionist (Gasparatos *et al.*, 2009), and thus focus on emerging performance (ante)narratives and their different representations may be more appropriate in collaborative settings where diverse voices coexist among a broad range of actors (Grossi and Argento, 2022).

At the same time, the findings indicated that in practice there is a tendency to 'fall back' on the quantification argument in relation to performance measurement. While the antenarratives of CE performance were multiple and varied, often their translation into written performance accounts, included in sustainability reports, was halted by the inability to define a specific metric of performance. This issue was particularly pertinent in the social and economic performance narratives, whereas the environmental narratives resulted in formulation of additional KPIs, therefore granting environmental issues more visibility in the reporting. As such, the difficulty of quantifying different aspects of sustainability performance resulted in decreased focus on monitoring their progress and formalising their successes.

The primacy of quantification in accounting for sustainability performance creates a challenge for opportunities of dialogic accounting. As illustrated by the example of Amsterdam, the performance quantified by the KPIs was not "telling the whole story". Different groups of actors – municipality, advisory firm, research and innovation lab, and innovation centre members – brought forward narratives of performance, granting visibilities to different aspects of CE (Brown, 2009). In the project, these visibilities were formalised in written narratives through the use of tools such as Theory of Change or Social Return on Investment, as well as through written narrative accounts. However, with the push for harmonisation of sustainability performance accounting, such opportunities might be lost. This study argues that accounting for multiple narratives, particularly in settings of collaborative governance and co-production approaches (Grossi and Argento, 2022; Steccollini, 2019), can be an opportunity for increased representation and implementation of principles of dialogic accounting in practice (Brown, 2009; Brown and Dillard, 2015).

Lastly, the study explored how some antenarratives became more prominent than others in the circular economy initiative. The translation of narratives into visual inscriptions (Latour, 2005) played a key role in increasing their visibility and frequency of use in the initiative. Even though antenarratives are most often told orally (Corvellec, 2015), the visual, graphic quality of their translations meant they were more frequently referred to and mobilised during meetings, workshops, and informal chats. A key example was the behavioural wheel, which was even suggested as a way to quantify some of the social performance outcomes. Conversely, some narratives emerged *from* inscriptions, such as the narrative of environmental performance, which, aided by the environmental consultants as key mediators (Latour, 2005), became one of the strongest narratives in the initiative.

Conclusion

The public sector not only has a significant impact on the progress to sustainable development (Kaur and Lodhia, 2019), but is also said to have

inherent responsibility to promote sustainability agenda (Ball *et al.,* 2014). In recent years, delivery of public services and innovation in this field are increasingly executed through collaborative, participatory initiatives (Steccollini, 2019). Their organisation is characterised by collaborative governance (Grossi and Argento, 2022), where accounting has potential to represent the multitude of values and interests of diverse stakeholders (Brown, 2009). However, recent debates within sustainability accounting literature point towards an increasing interest of practitioners, researchers, and standard-setters in the 'harmonisation' of sustainability accounting frameworks and reporting approaches. With an example of a circular economy initiative, this study explored how sustainability performance was understood and narrated in a collaborative setting, and what implications this may have for harmonisation of sustainability performance frameworks.

This study adopted a narrative theory (Corvellec, 2015; Boje, 2001) and mobilised concepts of 'translation' and 'mediators' from ANT (Latour, 1999; 2005) to examine the fragmented, unplotted, emerging antenarratives that have not yet stabilised (Boje, 2001). Using the concepts of 'translation' and 'mediators' further allowed to illuminate how the emerging narratives move in the initiative, with the help of specific actants and inscriptions (Latour, 2005).

The investigation of the circular economy initiative in Amsterdam resulted in three key conclusions. First, the findings illuminated the multitude and diversity of antenarratives about sustainability performance that were part of the storytelling in the collaborative initiative. The antenarratives reflected the social, environmental, and economic aspects of sustainability (Elkington, 1997) and changed depending on the actors and activities performed. The multitude of narratives challenges the harmonisation approach (Adams and Abhayawansa, 2022) in collaborative initiatives specifically, and in public sector more broadly, as not all aspects of sustainability can be easily monetised. Second, the study pointed towards the tendency of favouring narratives that can be translated into quantified metrics. This primacy of quantification challenges the principles of dialogic

accounting, which argue for increased diversity and variety of accounts, as different groups of actors provide different visibilities through quantitative and qualitative accounts (Brown, 2009). Lastly, the findings illustrated the role of visual inscriptions (Latour, 2005) in strengthening different antenarratives in a collaborative initiative. As the narratives were translated into diagrams, graphs, and mind-maps, they gained significance and ability to be mobilised during various meetings, workshops, and informal chats.

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Article 2

Co-creating sustainability performance accounts in cities via tinkering and bricolage

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Abstract:

Purpose: Existing performance assessment frameworks, such as the Sustainable Development Goals (SDGs), struggle to incorporate diverse voices and representations of heterogeneous contexts. Cities, in particular, present a challenging context for sustainability performance assessment as they pursue new forms of governance based on the multiplicity of actors and inter-organisational collaboration. This study explores how sustainability performance accounts are created at the urban level within collaborative forms of governance and amidst the plethora of available devices for performance assessment.

Design/methodology/approach: This study adopts a case study approach. Qualitative methods are mobilised to study a large European project focused on the urban transition to a circular economy in six participating cities. The construction of sustainability performance accounts is studied via the Actor-Network Theory lens.

Findings: The study highlights that when it comes to sustainability assessment in city initiatives, existing performance assessment devices are adapted and modified to fit local needs, and other sources of performance information are spontaneously mobilised to address the different dimensions of sustainability.

Originality/value: This study contributes to the public sector accounting literature by explaining the process of modifying existing devices for performance assessment to allow for the co-creation of accounts and by illuminating the spontaneous way in which performance information is generated and combined.

Keywords: public sector accounting, sustainability accounting, performance assessment, circular economy, cities, Actor-Network Theory

Paper type: Research paper

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Introduction

Adopted in 2015 by the United Nations (UN), the Sustainable Development Goals (SDGs) provide an agenda and guidance for achieving global progress while tackling climate change, reducing inequalities, improving health and education, and preserving natural habitats (United Nations, 2015). The SDGs aspire to stimulate change on different scales, from individual citizen action through companies, cities, and regions to national and transnational initiatives. Performance measurement has been identified as a key accountability process for tracking national and local contributions to the SDGs (Abhayawansa *et al.,* 2021). The SDGs are also one of the globally recognised sustainability performance frameworks (Bebbington and Unerman, 2018), defining the measurable aspects of sustainability via financial, societal, and environmental metrics (Quattrone, 2022). They are one of many devices, that is, 'frameworks, tools, and templates' (Ruff, 2021, p. 332) used in sustainability performance assessment, which have proliferated both in practitioner and academic sources (Gasparatos *et al.,* 2009). However, attempts to create a universal performance assessment device for sustainability (see Cagno, 2023) are problematic because of the need to adapt general schemes to diverse local contexts and multiple dimensions that characterise sustainability (Ruff, 2021). Indeed, even by seemingly expanding the realm of what is measurable to social and environmental issues (Quattrone, 2022), the SDGs limit the debate and inclusion of different priorities and understandings of sustainability, as 'any single perspective involves the non-reporting of others' (Brown, 2009, p. 317). This is the case for most devices suggested for sustainability performance assessment; these devices have been labelled as 'reductionist' because they only consider a single perspective (Gasparatos *et al.,* 2009). Meanwhile, sustainability should be accounted for based on participatory approaches, building on dialogic accounting (Thomson and Bebbington, 2005; Brown, 2009; Brown and Dillard, 2015).

Cities have been identified as key actors in achieving sustainable development with a dedicated Urban Sustainable Development Goal that

aims at making them inclusive, safe, and resilient (Klopp and Petretta, 2017; Grossi and Trunova, 2021). Simultaneously, cities have been gaining relevance in the public sector accounting literature, studied as complex systems where actors require collaboration across organisational boundaries to achieve common goals (Brorström *et al.,* 2018; Grossi and Argento, 2022). To achieve the SDGs and remain competitive, cities have introduced strategies to become more sustainable (Guarini *et al.,* 2021), turning to concepts such as a circular economy (CE) at an urban level (Bekier and Parisi, 2023). While its definition is contested (Corvellec *et al.,* 2022), the CE essentially opposes the linear production and consumption system in which resources are extracted, transformed, used, and disposed of. The implementation of CE initiatives in cities requires cross-sector collaboration and the involvement of heterogeneous stakeholders because of the growing need to monitor and disclose various elements of sustainability performance to remain competitive (Grossi and Steccolini, 2014). CE initiatives are key examples of collaborative governance, whereby the blending of the resources and interests of various stakeholders generates a need for new accounting approaches (Grossi and Argento, 2022). Dialogic accounting approaches (Brown, 2009) that address the diversity of stakeholder values and interests could be particularly relevant to CE initiatives in cities. However, dialogic accounting approaches contrast with performance assessment devices, which are often imposed on CE initiatives, creating tension and potential resistance (Sobkowiak *et al.,* 2020). Therefore, it is important to understand what happens when performance assessment devices are given yet fail to embrace the multidimensionality of sustainability and to include relevant actors. Moreover, little empirical evidence exists in the public sector accounting literature on performance assessment practices in collaborative arrangements (see Grossi and Argento, 2022). This study addresses this gap by examining how sustainability performance is accounted for in cities implementing CE initiatives. Particular attention has been paid to how sustainability performance measures are imposed, challenged, and transformed in CE initiatives in cities.

This study relies on a constructivist perspective on sustainability performance accounting to uncover its emergence and practices within cities. Specifically, it adopts an Actor-Network Theory (ANT) perspective (Latour, 1987; 2005) and leans on the concepts of tinkering (Knorr, 1979; Latour, 1981) and bricolage (Lévi-Strauss, 1966; Latour, 1981) to better understand the idiosyncratic circumstances that lead to the creation of sustainability performance accounts in CE initiatives in cities.

The paper is structured as follows: first, the paper is positioned at the intersection of public sector accounting and sustainability accounting by introducing recent debates in these two streams of literature. Subsequently, the theoretical concepts of bricolage and tinkering are introduced as useful perspectives for studying sustainability performance accounting practices in the city context. Finally, the empirical setting and data collection methods are presented, followed by a discussion of the findings, conclusions, and recommendations for further research.

Accounting for sustainability performance in cities

The public sector has been recognised as an important context for studying accounting in general, and particularly performance assessment, due to its distinctive features, namely, the heterogeneity of its organisations and stakeholders, scale of operations, ambiguity of goals, multifaceted performance, and diversity of accounting practices (Lapsely, 1988). Considering political influences and complicated levels of accountability, the public sector is a context characterised by inherent complexity (Arnaboldi *et al.*, 2015), making performance assessment a challenging task (Arnaboldi and Azzone, 2010). Issues pertinent to the public sector become even more evident when studying cities (Lapsley *et al.*, 2010) and sustainability initiatives therein due to the lack of a clear definition of sustainability (Bebbington, 2009) and the broad collaboration required for its achievement (Bebbington *et al.*, 2007).

Cities as examples of collaborative governance

A city can be defined as a '*complex, dynamic ecosystem through which resources flow between a myriad of actors, across multiple scales and sectors'* (Williams, 2019, p. 2751). Within the ecosystem, different strategies and objectives are pursued through specific initiatives that require collaboration across organisational boundaries (Brorström *et al.*, 2018) and citizen participation to ensure citizen needs are met (Grossi and Argento, 2022). City initiatives, where multiple organisations from different sectors work towards a common goal and involve citizens in solving specific social problems, are key examples of collaborative governance (Grossi and Argento, 2022). Such arrangements consist of a broad range of actors, which blend different resources and interests, necessitating the development of new accounting tools and approaches (Grossi and Argento, 2022). Given the variety of interdependent actors involved, some scholars have proposed that the performance of city initiatives should be accounted for through systems that support information flow and stimulate dialogue between these actors (Almqvist *et al.,* 2013). The goal of performance information in such settings is to improve the outcomes of collaborative efforts rather than intra-organisational efficiency and effectiveness (Almqvist *et al.,* 2013). Thus, outcome-based performance assessment is likely to be pursued, as it would support public service improvement and facilitate collaborative performance (Campanale *et al.*, 2021). Moreover, given that collaborative initiatives' performance assessment should take into consideration multiple values, new approaches should account for both financial and non-financial performance (Grossi and Argento, 2022).

As performance assessment is expected to take new forms in collaborative initiatives (see Almqvist *et al.*, 2013; Grossi and Argento, 2022), it has the potential to become more '*multi-voiced*' and '*attuned to a diversity of stakeholders' values and interests'* (Brown, 2009, p. 317). In other words, rather than relying on the traditional monologic accounting approach, the new performance assessment systems can fully embrace citizen-oriented practices of dialogic accounting (Grossi *et al.*, 2023; Brown and Dillard, 2015; Brown, 2009). In

contrast to monologic accounting, which privileges a single perspective centred on the needs of financial capital (Brown, 2009), dialogic accounting has the potential to embrace diversity, avoid 'monetary reductionism', and ensure participatory processes and access for non-experts (Brown, 2009). In this pursuit, dialogic accounting opens up the discussion of different framings (Brown and Dillard, 2015), whereby a situation can be accounted for in various ways to 'illuminate' its many sides (Brown, 2009). Accounts can be both quantitative and qualitative, with narratives and visual images playing an important role as different groups of actors provide different visibilities (Brown, 2009).

Particularly, accounting for sustainability in city initiatives presents a strong potential for the development of new, multidimensional, and participative approaches that would engage multiple viewpoints and take stakeholder engagement seriously (Brown, 2009; Bebbington *et al.*, 2007; Thomson and Bebbington, 2005). Actors engaged in city initiatives may have different views on the goals of the initiative and how to account for its outcomes (see Arnaboldi and Azzone, 2010). A monologic accounting approach privileges financial representations and a shareholder perspective (Brown and Dillard, 2015), inherently excluding other accounts. Meanwhile, sustainability performance encompasses the environmental, social, and economic levels of systemic change, potentially requiring accounting devices other than traditional quantification and key performance indicators (Brorström *et al.,* 2018).

Challenges in accounting for sustainability performance

In recent years, sustainability and sustainable development have developed as areas of concern for accounting and, not least, for performance assessment (e.g. Hopwood *et al.,* 2010; Bebbington, 2007). However, the concept of sustainable development poses significant challenges in this field of research.

First, sustainable development suffers from a lack of clear definitions in the organisational context (Bebbington and Larrinaga, 2014; Bebbington,

2009). As sustainable development is 'politically plastic' (Bebbington, 2009, p. 189), meaning it can be interpreted and acted upon in various ways, what constitutes 'good' or 'bad' performance in relation to sustainable development remains unclear and contested (Bebbington, 2009). The SDGs are meant to address this issue by indicating, with 17 goals, 169 targets, and 232 indicators, the sustainable development aspects that should be prioritised. However, in so doing, the SDGs seem to pursue the '*infallible truth*' (Boyce, 2000, p. 53) about global sustainability rather than facilitating and broadening the debate and allowing for more diverse representations of values and priorities. Additionally, while the SDGs are developed globally, the measurement and reporting task is imposed on individual organisations or initiatives, which often operate in specific local contexts. Without clear guidance and capacity building to enhance organisational or governmental capabilities to measure and report SDGs, local interpretations and bottom-up approaches to accounting for performance are likely to emerge (Sobkowiak *et al.,* 2020). Yet, research providing rich details on emerging sustainability and SDGs accounting practices is still scarce (Bebbington and Unerman, 2018), and studies demonstrating dialogic accounting in practice are lacking.

Second, the uncertainty of solutions and the ever-changing nature of circumstances pose another challenge to sustainability performance assessment. In other words, sustainable development presents itself as one of the 'wicked problems' of our times (Bebbington and Larrinaga, 2014), whereby '*"solutions" require continual reworking as actions taken often create other manifestations of problems*' (Bebbington and Larrinaga, 2014). Simultaneously, sustainability and sustainable development address a wide range of issues and scales (Gasparatos *et al.*, 2009), and they require continuous and active input from diverse fields of expertise to tackle them. Their achievement requires changes in entire ecosystems, economic sectors, societies, and cities, which cannot be approached by breaking them down into their components due to the constitutive nature of the interrelationships between them. Therefore, Gasparatos *et al.* (2009) suggest using multiple methods

for sustainability performance assessment rather than resorting to traditional 'reductionist' performance measurement devices. In other words, they suggest that 'methodological pluralism' and increased stakeholder participation can be the key to achieving more concrete and relevant sustainability assessments (Gasparatos *et al.*, 2009, p. 253). However, this argument assumes that various sustainability assessment devices can be selected and combined in an 'conscious attempt' to apply methodological pluralism (Gasparatos *et al.,* 2009, p. 253). Given the sustainability accounting challenges, it is possible that a conscious selection of devices to assess sustainability performance will be difficult for many organisations and their initiatives. Furthermore, although mobilising various methods for sustainability accounting expands its reach to include diverse stakeholder values and interests, it does not align with dialogic accounting, where participatory processes, enabling accessibility for non-expert audiences, and avoiding new forms of monologism are highlighted (Brown, 2009).

Theoretical framework

Tinkering and bricolage

This study explores the practice of accounting for sustainability performance in collaborative initiatives in cities, with a particular focus on how sustainability performance measures are imposed, challenged, and transformed therein. To better understand the local, idiosyncratic circumstances that bring about accounting change and innovation, the concepts of *tinkering* (Knorr, 1979; Latour, 1981) and *bricolage* (Lévi-Strauss, 1966; Latour, 1981) are particularly useful. Introduced by Lévi-Strauss (1966), the term 'bricolage' can be roughly translated as 'making do' with the available resources (Lévi-Strauss, 1966; Baker, 2007; Baker and Nelson, 2005), both on the ideational and material levels. The former refers to the process of recombining the elements of ideas, myths, and stories to create new myths that can serve new functions. The latter refers to processes *'through which people use and combine the various resources they have "at hand" as a*

means of finding workable–if typically imperfect–approaches to a wide variety of problems and opportunities' (Baker, 2007, p. 697). Bricolage often invokes ideas of improvisation; while the two are related, they should not be seen as synonymous (Baker, 2007). Similarly, bricolage is often perceived as leading to suboptimal results, although that is not always the case – on the contrary, bricolage can often '*reach brilliant unforeseen results*' (Lévi-Strauss, 1966, p. 17). Given its focus on creation, the concept of bricolage has been used to investigate the processes of research, knowledge development (see Latour, 1981) and innovation (see Baker, 2007). The concept of 'tinkering' is linked to opportunism (Latour, 1981) and acting upon heterogeneous or changing circumstances to arrive at a solution (Knorr, 1979). Similar to bricolage, it is about 'making do' and adjusting or modifying the resources that are readily available. The terms 'bricolage' and 'tinkering' have been often used in parallel since Knorr (1979) and Latour (1981) mobilised them to discuss the research and development process of scientific knowledge. Further adopted by accounting scholars (see Dambrin and Robson, 2011), they can be succinctly defined as *'the use of available resources, practices, cultural artefacts or institutions in new combinations to achieve change'* (Nicholls, 2009, p. 756), which is the definition we will follow in this study.

The concepts of tinkering and bricolage are borrowed from studies within the ANT tradition (Latour, 1987; 2005), which informs our analysis. Having a broad foundation in ANT allows us to *'get into the middle of action and observe it'* (Barter and Bebbington, 2013) to understand how sustainability performance is accounted for in practice, before the accounts stabilise. Rather than studying publicly available numbers indicating sustainability performance, this study follows the networks of human and non-human actants (Latour, 1987; 2005) that lead to their construction. Here, 'actant' is understood as the source of action, that is *'something that acts or to which activity is granted by others'* (Latour, 1996, p. 373). By recognising actants, the connections they develop, and their impact on transforming performance accounts, we investigate sustainability performance measurement before it becomes a 'black box' (Latour, 1987).

Several notable accounting studies adopt an ANT perspective (see Justesen and Mouritsen, 2011), exploring the emergence of new accounting systems in various public sector settings (see Preston *et al.,* 1992; Arnaboldi and Azzone, 2010; Bruno and Lapsley, 2018; among others). However, sustainability performance assessment in collaborative initiatives is yet to be investigated with an ANT lens. In light of the recent developments in public governance and organising public life (Grossi and Argento, 2022; Almqvist *et al.*, 2013), particularly visible in the functioning of cities, we want to investigate how actors 'make do' with the existing devices, methods, and information available to account for sustainability performance in collaborative initiatives. To that end, mobilising the tinkering and bricolage concepts allows us to study the interplay between various performance assessment devices and their local adaptations, thus generating unique insights into the public sector and sustainability accounting.

Research context and methods

This study uses qualitative methods within a case study approach (Stake, 2000) to investigate how sustainability performance is accounted for in cities that implement CE through collaborative initiatives. As sustainable development has been criticised as vague and challenging for practical implementation (see Kirchherr *et al.,* 2017), various concepts have emerged as potential operationalisations, complements, or substitutes, with CE being discussed as one such approach (Wishart and Antheaume, 2021). In essence, CE opposes the linear approach in which resources are extracted, transformed, used, and disposed of as waste and promotes a regenerative economy in which resource extraction is limited and the life of existing resources is extended. There is no single definition of CE, as the concept has a long history and multiple affiliations (Wishart and Antheaume, 2021); however, based on a literature review of 114 definitions, Kirchherr *et al.* (2017) conceptualised it as: *'an economic system that replaces the "end-of-life" concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates […] with the aim to accomplish sustainable development, thus simultaneously creating environmental quality,*

economic prosperity and social equity, to the benefit of current and future generations.' (2017, p. 229). Taking this definition as a point of departure, the CE is considered in this study as one of the available means to pursue sustainable development strategies, ultimately contributing to achieving the SDGs. Given its ambitious reimagining of current consumption and production patterns, the CE is considered a setting in which practices and issues related to sustainability performance assessments are particularly visible.

Consequently, this study follows a large-scale European project funded by the European Commission (EC) under the Horizon 2020 programme, which aims to *'develop circular and regenerative cities through the re-localisation of production and the re-configuration of material flows at different scales'* (Project Internal Document, 2019). The three-year project has the concrete ambition to support cities in adopting CE principles that would further advance their efforts to achieve the SDGs (Project Internal Document, 2019). The project involves six cities, each in a different European country, that are actively engaged in the development and testing of innovative solutions with the potential to address the most pressing sustainability challenges. These solutions range from redefining the role of municipal food markets to developing new solutions for the collection of discarded textiles or designing plastic sorting units for healthcare institutions. While the solutions differ in their focus, the approach to their development is common across the project, with a strong emphasis on citizen involvement through consultations and workshops at different stages of solution development. With each city team focusing its efforts on the most pressing local needs identified and applying a similar approach to solution development, the differences between the six cities in terms of population size, location, and political climate, among others, become less pertinent to this study. Each city team that leads the initiative has a unique composition but typically consists of municipality representatives, small- and medium-size enterprises, FabLabs (defined as workshops providing public access to tools and skills), and several local partners. The overall project management is conducted centrally by one coordinating organisation and locally by one

key organisation in each city. The EC requires periodic and final reporting; however, city teams are also accountable to local stakeholders and communicate with them regarding the performance of the CE initiative.

Initially, each city's performance was supposed to be assessed using three devices purposefully selected to address different aspects of sustainability (Project Internal Document, accessed 10-10-2022):

1. Theory of Change (ToC), which is often used in non-governmental organisations and the public sector to illustrate how an intervention will lead to a desired impact, presents a detailed roadmap of activities and their links to outputs and outcomes (Anderson, 2009). In this study's CE initiatives, the ToC identifies the desired outcomes and provides a narrative account of how they were achieved.

2. Key Performance Indicators (KPIs) quantify the changes in environmental, social, and economic dimensions.

3. Social Return on Investment (SROI) assigns financial proxies to monetise the societal outcomes of interventions (Ruff, 2021). In this study's CE initiatives, the SROI provides a valuation of the potential social impact of the prototyped solutions.

These devices constituted the project's performance assessment framework, as defined in the project proposal. Not all project partners were involved in writing the proposal or defining the performance assessment framework. As the proposal subsequently became a binding agreement for all project partners once the project received funding, the framework became imposed on participating city teams. As such, it can be understood as a top-down, predefined performance assessment framework, similar to many sustainability frameworks that exist, not least SDGs (Sobkowiak *et al.,* 2020). However, as this study demonstrates, the framework and its three constitutive devices were a source of controversy, and other methods of performance assessment were drawn upon by city teams.

Methods

In line with the ANT approach, this study relies on multiple data sources (Barter and Bebbington, 2013), such as field observations, formal and informal documents, visualisations, and semi-structured interviews. This flexibility allowed us to obtain varied accounts of the performance assessment practice and follow key actants, also non-human (Latour, 2005). Data collection occurred over a 30-month period between late 2019 and mid-2022. The authors had full access to the project, which allowed them to gain close and detailed insights into how the performance of the participating cities was accounted for. Prolonged field engagement helped us develop an in-depth understanding of the context, including the relationships between actants, various devices, and artefacts involved. Data from 100,5 hours of participant observation and 12 individual interviews was analysed for this study.

The observations were conducted primarily in meetings in which various methods of performance assessment were in use or under debate. Particularly, we followed the KPI iterations (21 hours), ToC iterations (22 hours), project meetings and workshops (52 hours), and meetings of project managers (3 hours). In the project studied, the iterations of KPIs and ToC referred to workshops in which city team members discussed, defined, proposed, and transformed KPIs and ToC elements to represent developments in their city's CE initiatives. Two project review meetings, the midterm review and the final review, were also observed, and city presentations were included in the analysis (2,5 hours). Most meetings were recorded and extensive field notes were taken to document some of the unspoken changes, such as modifications to the KPI lists or ToC visualisations. Field notes were also used when recording was not possible. The inscriptions related to the performance of the cities were also part of the analysis, including the performance reports in project deliverables, the Grant Agreement (GA), the spreadsheet where indicators were modified, and the online whiteboards where different performance assessment devices were combined (see Table I).

The observational and documentary data were supplemented with semi-structured interviews conducted with key actors involved in the performance assessment of the city initiatives, namely the city team members and project managers in the European project. The interviews aimed to clarify the meaning and motivation behind certain performance assessment practices in the project and to gain insight into sustainability accounting practices from various perspectives. All interviews were recorded and transcribed. Details of the interviews and documentary data collection are presented in Table I.

Interviews				
Interviewee	**Role in the project**	**Organisation**	**Date**	**Duration**
1	Project manager	University	27/09/2022	40min
2	Pilot [cities] coordinator	Non-profit	04/10/2022	35min
3	Project officer	University	21/11/2022	35min
4	Performance assessment specialist	Consulting company	11/11/2022	30min
5	Performance assessment specialist	Consulting company	30/09/2022	40min
6	City team member	Municipality	23/09/2022	30min
7	City team member	FabLab	23/09/2022	35min
8	City team member	Municipality	27/09/2022	50min
9	City team member	FabLab	10/11/2022	30min
10	City team member	Non-profit	22/11/2022	45min
11	City team member	Municipality	22/11/2022	45min
12	City team member	Non-profit	23/11/2022	30min

Documents			
Document	**Document name**	**Key data**	**Published/ obtained**
1	Project Grant Agreement	Formal performance assessment framework	01/12/2019
2	Deliverable 1	Potential redesign of assessment framework	29/02/2020
3	Deliverable 2	Pilot city strategies	31/05/2020
4	Deliverable 3	Revised KPIs	31/05/2021
5	Deliverable 4	Project performance evaluation	30/11/2021
6	Deliverable 5	Final performance assessment	31/05/2022
7	KPI iterations spreadsheet	KPI revision history	21/07/2020
8	Online document with ToC information	ToC revision history	30/03/2020
9	Online document with KPI information	KPI revision history	07/04/2021
10	Online document with SROI information	SROI revision history	06/01/2022

Table I. Data sources. Table by authors.

The analysis was conducted on field notes, interview transcriptions, and documents and involved two rounds of coding carried out manually using NVivo software. The initial round of open coding was conducted to identify themes emerging from the data, which highlighted the variety of tools and methods used in sustainability performance assessments, issues with

individual performance assessment tools, and modifications made to them in response to local contexts. A subsequent round of directed content analysis (Hsieh and Shannon, 2005) used concepts from ANT, such as tinkering, bricolage, or translation, applied as codes. For instance, particular expressions about how performance was accounted for, such as 'patchwork', 'ad hoc', 'unorganised' or 'spontaneous', among others, were coded as bricolage, while 'modified', 'adapted' or 'changed' were coded as tinkering, in line with our theoretical framework.

Research results

Devices suggested for performance assessment in the project

Formally, the performance of cities in the CE project was guided by the GA. The GA represents a contract between all project members and the institution funding the project; it broadly describes the project's objectives and planned activities. Given that the GA was drafted in line with the funding requirements of the EC, its contents inherently translated the broader interests and policy ambitions of the EC into local innovation projects in the participating cities. The GA was a powerful actant with strong influence on the project's actions and practices. It was circulated, debated, referred to, and mobilised in various situations, having an impact on how things in the project were done – that is, it *made others do things* (Latour, 2005). Given that the GA put forward an objective for the project to *'provide critical examples of ways in which cities can adopt a CE model and reach the 2030 Sustainable Development Goals'* (Project Internal Document, accessed: 10-10-2022), it advocated for the SDG agenda and assumed the cities' performance should contribute to its achievement.

According to the GA, the assessment of the cities participating in the project should rest on three devices: ToC, KPIs, and SROI. Each device was expected to be implemented by the participating city teams in line with its traditional use, that is, following the steps described in the literature (Nesta, 2019; SROI Network, 2012). Additionally, the GA defined nine

KPIs for each city participating in the project. The KPIs imposed by the GA are listed in Table II.

Performance indicator	**Target**
Number of textile specific city resources identified (materials, infrastructures, etc.)	100
Number of specific textile streams identified	10
Number of governance / business models developed	5
% textile regenerated (current 20% of complete stream)	40%
Overall stakeholder satisfaction with new models	80%
Number of new applications far textile waste developed	10
Willingness to pay for regenerated products and materials	80%
Number of local makers and business reached through showcases	2,000
Number of citizens engaged through educational programmes	500

Table II. KPIs included in the Grant Agreement. Example of City A. Table by authors.

Imposed performance assessment devices become contested

As the project progressed, the devices imposed by the GA were contested by the participating cities, who considered them confusing, restrictive, and ill-fitted to their approach of co-designing CE solutions with various stakeholders. Particularly, KPIs were a source of controversy among city teams, seen as outdated or irrelevant to how the project developed. In one of the meetings, a municipality employee described the key issues: *'They [KPIs] capture only a part of the journey, and it is very partial. It is not the whole story […]. The indicators are also not able to capture some of the perspectives of the stakeholders or beneficiaries […]'* (Municipality employee, City D field visit, 08-11-2021). In other words, the suggested devices were not seen as useful for

dialogue with diverse audiences or for representing different perspectives; rather, they were treated as another top-down accountability mechanism. Initially, the project management team aimed to keep the existing KPIs unchanged, primarily because they were useful for benchmarking between cities and as a key accountability mechanism for the EC. However, as the city teams developed their initiatives in different directions, the concerns regarding these KPIs mounted and the tensions increased, and thus the position of the project management team also begun to change: *'Of course, these KPIs are in the GA, so we need to be compliant. But the EC is also aware that these KPIs have been written long ago, […] so it is completely reasonable for us to change some KPIs, some numbers, if we find it necessary'* (Project manager, City D KPI calibration meeting, 02-09-2020). The project manager later reflected that *'these KPIs were disconnected from the reality of the cities'* (Project manager, Interview, 27-09-2022).

The need for KPI iterations emerged from the city teams' dissatisfaction with the perceived rigidity and lack of contextual fit of the KPIs imposed by the GA. The CE initiatives pursued in cities were inherently complex, due to their collaborative nature and the objective of generating multiple values (Grossi and Trunova, 2021) as well as the high ambiguity caused by the lack of an agreed-upon definition of CE (Kirchherr *et al.,* 2017). As the City Teams Coordinator reflected, there were manifold areas that could be addressed in the CE initiative: '*for the cities, it is really about: what are your objectives and why? What is the context of your city and how are you going to address the circular economy through the different lenses? How are you addressing governance or policy issues, technology or social [aspects]?'* (City Teams Coordinator, Project coordination meeting, 13-01-2020).

Consequently, there was a push for tinkering with the existing indicators, which allowed the city teams to respond to heterogeneous contexts and changing environments in their indicator design, as the CE solutions were yet to be defined (Knorr, 1979; Latour, 1981):

'We had to modify the KPIs as we progressed in the project, because the reality was facing us, and the reality is not always something you can write in a grant proposal. It was

absolutely necessary to modify the KPIs, otherwise we would have had a project focused only on meeting KPIs – and this is not what [this initiative] was about. I realise that measurements are necessary. But the measurement is a means to an end and not an end itself.' (City A team member 1, Project meeting 7-10-2021).

In response, a process was designed for city teams to iterate the existing KPIs; that is, to modify the KPIs in a series of workshops with all city team members present and to construct, via co-creation, additional KPIs as deemed necessary. The process of KPI development consisted of three key steps: (1) longlisting, where a repository (so-called longlist) of CE KPIs was created based on practitioner and academic sources; (2) shortlisting, where each city team member negotiated the KPIs most relevant to measure their performance; and (3) calibrating, where both the KPIs in the GA and the newly selected KPIs were modified and finetuned to best fit the cities' ambitions and reality.

Tinkering with and co-creating KPIs

In practice, the process of constructing the final set of KPIs in each city involved dialogue between team members and project managers, trialling various indicators, and adapting their descriptions and targets. In discussing and modifying the KPIs, the city team members effectively engaged in the process of their co-creation.

In City E, which focused on increasing the circularity of temporary construction materials, different city team members initially expressed different priorities for the project. For instance, the municipality representative focused on partnerships with zero-waste events, while the FabLab members focused on materials, cost, and aesthetics. As the project progressed, an initiative was developed to support start-ups through incubation programmes. A discussion emerged on how to best measure the success of such an approach:

'PM: Then on governance, we have "new forms of financing". What is your ambition when it comes to new forms of financing?

E1: It could be mixed forms of financing for developing new solutions, like public-private, crowdfunding, and so on. I don't know, what do the others think?

E2: For me… is this not about business models? There is a GA KPI on business models.

E1: For me, from the incubation point of view, this KPI on forms of financing would refer more to the phase before a business is established, how you kick off a business. For instance, what we are experiencing now in our organisation… [gives an example of new project supported].

E3: I am not an expert, but I can't see that we will come up with five new forms of financing. I think it's more on new expertise or the way you manage your project economically and help others doing it. But how many new ones can we really see?

E1: I can see that we responded with a high number on the survey for this KPI. And I think it's because we know we are supporting very fragile project leaders, because they are in very early project development stages, so we thought we needed to find new ways of funding them. […] For me, in P3 we talk about success cases, new business models established. Here, we are trying to evaluate how many projects enter the incubator, even though some of them will fail.

PM: Maybe changing it into "number of projects that receive support" would be appropriate? [conversation continues]' (KPI iteration workshop, City E, 30-07-2020)

The indicators were modified, commented on, and elaborated on in a spreadsheet, which ultimately became a powerful actant in the project, as various interests were translated into specific indicators and targets. The spreadsheet was mobilised at different times in the project and travelled between city team members, project managers, various reports and deliverables, and different groups of local stakeholders, where it was used to gather allies for agreed-upon solution development.

The process of tinkering with existing KPIs was considered important for two reasons. First, it served as a mechanism to deal with the uncertainty of the CE, providing more time to define and prototype the solutions. CE, as

operationalisation of sustainable development, addresses one of the 'wicked problems' of our times, where results of undertaken actions often not only fail to fully resolve the problem but also illuminate its other manifestations (Bebbington and Larrinaga, 2014). For the cities studied, this issue was partially addressed through the iterative development of KPIs and their ability to tinker with them. Second, the process of tinkering with KPIs, which was visible during the KPI iteration workshops, allowed for a debate between city team members and their stakeholders, in which different actors argued for the assessment of project aspects that were important to them. As one of the project managers reflected, this increased the feeling of project ownership among the city team members:

'It was good that the cities could rethink and recalibrate the proposal KPIs and had the freedom to take some of them out. […] maybe the achievement of KPIs is not so critical, but the context where these KPIs were created. Because the process itself actually created some ownership among the pilot city members over their own project, so it was very important.' (Project Manager, Interview, 27-09-2022).

Tinkering with and co-creating ToC

Given that the definition of specific indicators was often challenging for city teams (the iterations took place over a 24-month period), the ToC was discovered as a way to support it while simultaneously providing a qualitative narrative of the city's performance. Initially, the ToC template based on a well-recognised 'DYI (Development Impact and You) Toolkit' (Nesta, 2019) was used to guide city teams in developing their own ToC. There were eight questions related to the challenges at hand: key beneficiaries, planned activities, envisioned outputs, outcomes, and impact. Although the cities attempted to 'make do' with the available framework (Molecke and Pinkse, 2017), the categories were challenged to better fit the CE initiative. Consequently, the ToC was shifted from a simple spreadsheet to a more visual online whiteboard where the intertwined connections between various activities and stakeholders could be drawn more explicitly. Additionally, the framework was further tinkered with by adding a category of 'scenarios' to demonstrate various possible pathways that would lead to

the desired impacts, and by splitting the 'outcomes' category into short-term and long-term outcomes, further emphasising the temporal aspect of what is achievable. Finally, the ToC was further modified by the project managers, where each city's ToC was complemented with a project timeline and the activities of other project members to understand the potential synergies and requirements to achieve the desired performance. This demonstrated how, by tinkering with the existing device, the interests of project managers (i.e. achievement of objectives within the given operational and budgetary constraints) were translated into a device typically used for impact identification (Nesta, 2019).

Already in planning how the KPI development should unfold in the project, synergies between the KPIs and the ToC were identified, pointing towards a potential mediating relation between them: *'[the different steps] will promote some discussion and then refinement of the KPIs. I think that the Theory of Change will already bring that discussion to the table. Where they have the ideas clearly visible on a board or a sheet of paper, I think that will really help to narrow down everything else.'* (Consultant 1, KPI process design meeting, 03-02-2020). The idea was to maintain a close dialogue between the city teams and the two performance assessment devices, ToC and KPIs, which over time became key actants and mediators in the project. Indeed, as city team members added and modified descriptions of the desired impacts and planned actions over time, some of the existing KPIs were challenged, and new KPIs were suggested.

Acceptance of the adapted devices

After the suggested devices became instigators of dialogue and representations of various views on CE solutions, they were accepted for their relevance and benefits to the project. For instance, KPIs came to be considered crucial for setting boundaries and defining common ground between city team members. Given the ambiguity and multiple understandings of CE (Kirchherr *et al.*, 2017), it was particularly important to establish the framework of a CE intervention. The list of KPIs and related targets was a key actant in each city, promoting an agreed-upon understanding of CE and impacting the development of other project

activities. Meanwhile, the ToC was seen as a way to provide a more comprehensive account of the city's performance, where various assumptions could be communicated, accounting for contingencies in achieving the desired targets. As such, the ToC provided a space for cities to imagine what a good performance could look like: *'Theory of Change was a bit more high-level, to give a broad orientation of what a good performance would be in general. It was nice to have it done relatively early because it's not like the cities had no idea how a successful pilot or a successful city could look like'* (Performance management specialist 2, Interview, 22-09-2022). Given that the development of solutions for CE or sustainability requires continual reworking (Bebbington and Larrinaga, 2014), ToC provided the required flexibility and space for explanation.

Bricolage of devices to account for performance

Owing to the complexity of CE, which requires multilevel systemic change when implemented in cities (Prendeville *et al.,* 2018), performance assessment was problematic, and each of the suggested devices was criticised for its incompleteness. Given that neither the ToC nor the KPIs were seen as a 'complete' representation of the city's performance, the two were superimposed to create a coherent narrative with quantifiable outputs. A visual inscription of ToC was the basis for applying KPIs and their targets to specific activities and outputs, allowing project managers to 'make do' with the two devices that were otherwise deemed insufficient on their own. The prior translation of the ToC template from a simple spreadsheet into a colour-coded visual representation on an online whiteboard was key to enabling this process. Once the ToC was on an online whiteboard, it provided space for the interaction of different devices and for trialling them in different constellations. In other words, it allowed the bricolage of different devices, and the information extracted through them, that the city teams had at hand. The information was drawn not only from the agreed-upon KPIs, but also from other tools, such as Material Flow Analysis (MFA), value flow mapping, or SROI. Users of the online whiteboard based

on ToC could mobilise data and information from various devices that were deemed important to create a coherent narrative of the city's performance:

'All these tools have been used in an iterative way. So every tool has been in a way, reused and readapted step by step. The ToC, in my view, has been one of the more comprehensive tools, because it takes together different aspects. Because in the ToC you have the KPIs but also other kinds of tools to represent the process, how the stakeholders have been engaged and what they perceived of this process. […] And so at the end I feel that it's a kind of a frame in which we have worked in different steps and with the possibility to change and to adjust and to tell… the kind of storytelling of what has changed during that journey.' (City D team member 1, Interview, 23-09-2022).

As mentioned, the data required for performance assessment were gathered by city teams from various sources using methods serving different purposes in the project. While the devices existed in the project, they were not explicitly recommended for performance assessment; rather, the city teams mobilised them as deemed relevant and necessary at a given moment. This occurred spontaneously and within different timeframes in each city depending on when new information emerged through the use of different devices. For instance, MFA was used to map the material flows in each city; however, its focus was largely environmental, and data were gathered on a specific scale. MFA refers to a method of quantifying the flows and stocks of materials and visualising them to easily identify areas requiring improvement. Data collected for the MFA were often mobilised by cities, as they were deemed useful for creating a narrative about environmental performance and impacts and defining environmental KPIs. However, it provided no insight into the economic or social performance of each city. To that end, value flow mapping was used to understand the value created through different solutions, primarily in terms of economic value. Value flow mapping was introduced in the project to design a technological solution for a digital marketplace; meanwhile, having the information available, the cities used it to demonstrate the economic value created and, hence, good performance. The data collected to calculate SROI were mobilised to understand and communicate performance regarding the

social aspect of sustainability. Beyond these devices, more 'informal' data were often bricolaged into performance assessments; it consisted of stories, quotes, and pictures illustrating certain outputs and project results from the perspective of various stakeholders and beneficiaries. Instead of using a formal performance assessment framework, the cities in the project and the project managers drew upon the information available. The lack of intentionality in using multiple performance assessment devices was confirmed by one project specialist:

'I felt like it was a bit of a patchwork. […] I think it would be ideal if cities had a Theory of Change, and the different steps within it, and multiple indicators clearly assigned to know what data to collect and when, versus us trying to identify how we are progressing based on the information that we are collecting now, informing the next step, and then that informing the next step. […] But, at the same time, I think it requires too much effort to be the best option' (Performance management specialist 1, Interview, 22-11-2022).

Thus, in a largely ad-hoc manner, the city teams combined different data relevant to a 'holistic' performance assessment report of CE initiatives – such that would reflect the environmental, economic and social aspects of the interventions, in line with the idea of sustainability and SDGs (Ghisellini *et al.,* 2016). Furthermore, different devices were used to incorporate diverse perspectives and representations of sustainability. The data were subsequently translated into a combination of ToC narrative and KPIs. What emerged was a performance assessment based on methodological bricolage, in which the available data from various devices were combined and translated into a single form. Rather than following a single existing approach, the multidimensionality of CE resulted in cities collecting available data on its different aspects and stitching them together to create a common performance narrative.

Discussion

As sustainability grows in popularity, so does the number of 'frameworks, tools, and templates' (Ruff, 2021, p. 332) – that is, devices for performance

assessment of sustainability initiatives. The UN SDGs, the largest global sustainability framework, are a key example of this trend, with many more devices suggested by organisations and governments (see Bebbington, 2007; 2009; Bebbington *et al.,* 2021). Although sustainability performance assessment devices, such as the SDGs, seek to expand the view on what is measurable within economic, social, and environmental aspects (Quattrone, 2022), they are inherently 'reductionist' in nature (Gasparatos *et al.*, 2009) and limiting when it comes to inclusion of diverse voices and perspectives. In the context of collaborative governance (Grossi and Argento, 2022), particularly visible in city initiatives, sustainability performance should be accounted for based on participatory approaches that stimulate dialogue and support information flow (Thomson and Bebbington, 2005; Almqvist *et al.,* 2013). This can be achieved not least through dialogic accounting (Brown, 2009; Brown and Dillard, 2015). However, empirical evidence disentangling how such accounts are created in practice is scarce.

To contribute to this interdisciplinary debate, this study explored the context of collaborative city initiatives and the practice of performance assessment therein. We relied on the ANT approach (Latour, 1987; 2005) to examine the process of creating sustainability performance accounts before they become a 'black box' (Latour, 1987). The study results, which followed a performance assessment of six cities in a large European project, explained the dynamics through which performance accounts are modified and assembled spontaneously, allowing for the inclusion of diverse voices and representations. In essence, this study observed how performance accounts were co-created in line with dialogic accountability (Brown, 2009; Brown and Dillard, 2015).

First, the results illustrated how performance assessment devices imposed on cities became contested due to their inability to capture the perspectives of diverse stakeholders and various elements of sustainability performance. In response, performance assessment devices, such as ToC and KPIs, were tinkered with (Knorr, 1979; Latour, 1981) to address the development of CE initiatives, which resulted from new information collected, changing

circumstances (e.g. the COVID pandemic), and emerging local needs. The modifications unfolded over time and were based on ongoing inputs from different actors in the project. For instance, the process of developing contextually relevant KPIs to replace existing ones lasted for over 24 months and involved multiple iterations. This confirms that the local implementation of sustainability assessment frameworks is not merely a matter of transferring devices from the global to local levels (Abhayawansa *et al.*, 2021; Sobkowiak *et al.*, 2020). However, the findings also explained that tinkering with performance assessment devices, such as KPIs, created a space for dialogue and allowed various stakeholders to argue for the representation of project aspects that were important to them. Therefore, tinkering with performance assessment devices resulted in accounts being co-created and reflecting more diverse voices, values, and interests (Brown, 2009).

Second, the findings showed how, in a situation where performance assessment devices were suggested by the project contract, the project participants created performance narratives using available information via a patchworked and largely improvised process resembling material bricolage (Lévi-Strauss, 1966; Latour, 1981). While previous studies recognised that any accounting assemblage is *'imperfect and constantly in flux'* (Thomson, 2021, p. 239), this case further demonstrated that some accounting information is based on chance rather than meticulously collected data. The variety of information mobilised in performance assessment can be partly explained by the continuously evolving understanding of what good performance means and how it can be assessed and reported (Arnaboldi and Azzone, 2010), given the need for input from various stakeholders (see Abhayawansa *et al.*, 2021) and the complexity of the city system and its collaborative governance (Grossi and Argento, 2022; Brorström *et al.,* 2018). Drawing on various devices in an uncoordinated manner allowed the teams to capture the perspectives of various actors, both in terms of what was considered 'good' performance by different stakeholders and also what was considered good performance on various sustainability dimensions. As such, the

bricolage of performance information contributed to 'illuminating' the many sides of an urban sustainability initiative, not least by allowing for the incorporation of narrative or visual elements to provide different visibilities (Brown, 2009). Consistent with the findings of Gasparatos *et al.* (2009), this study illustrates that sustainability performance assessment requires more than a single methodology. However, it also suggests that the use of multiple devices is not necessarily a deliberate and conscious endeavour, as is the case in methodological pluralism (Gasparatos *et al.*, 2009), but rather it relies on 'making do' (Lévi-Strauss, 1966; Baker, 2007) with the information that is readily available.

Conclusion

In response to the growing importance of sustainability efforts, sustainability performance assessment frameworks, tools, and templates have proliferated in recent years (Bebbington *et al.,* 2021). However, the majority of them are 'reductionist' (Gasparatos *et al.*, 2009), and fail to stimulate dialogue and allow for the representation of various perspectives, values, and interests (Brown, 2009). This is particularly problematic in collaborative forms of governance (Grossi and Argento, 2022), where multiple actors work together, blend resources and interests, and involve citizens in the co-production of solutions. However, as most performance assessment devices are imposed on organisations, projects, and initiatives (see Abhayawansa *et al.*, 2021; Sobkowiak *et al.*, 2020), it is important to understand what happens when they fail to embrace multiple perspectives on sustainability and become contested by the actors involved.

Based on the key findings of a qualitative study of a large European project, this study makes a two-fold contribution to interdisciplinary accounting research. First, building on public sector accounting, this study disentangles the complexities of performance assessment in collaborative initiatives. It illustrates that, in situations where performance assessment devices are imposed on a city initiative, they are likely to be tinkered with (Knorr, 1979; Latour, 1981) and adapted to incorporate various voices and perspectives. Such processes, whereby new performance measures and accounts are co-

created, can contribute to addressing dialogic accountability (Brown, 2009; Brown and Dillard, 2015). Second, with reference to sustainability accounting, this study uncovers the mechanisms through which sustainability performance is accounted for when definitions of CE or sustainable development have not yet stabilised (Kirchherr *et al.,* 2017). In the process of creating holistic sustainability performance accounts, pieces of information generated both ad-hoc and by performance assessment devices are combined in a spontaneous, 'patchworked' manner, rather than via conscious attempts as the literature has so far suggested (Gasparatos *et al.,* 2009).

Additionally, this study illuminated how varied and 'messy' the practice of developing sustainability performance accounts can be; it also confirmed the challenges related to the implementation of standard performance assessment devices, such as the SDGs, in collaborative sustainability initiatives. While policymakers and regulatory bodies may attempt to develop novel sustainability performance frameworks or iterate existing ones, their efforts may not yield the desired results. For sustainability initiative managers, allowing more participatory approaches, where team members can collectively shape specific performance indicators, devices (e.g. ToC), and performance reports, can allow for a more diverse representation of ideas, perspectives, and understanding of sustainability. Consequently, as more aspects are represented in performance measures, ownership increases in the project, and more attention is paid to ensuring success.

This study is limited, as it follows a single case of a European project; however, we see it as a first step towards further empirical research into the practices of sustainability performance assessment in collaborative initiatives in cities. The special characteristics of the SDGs, and not least the multinational consensus for their implementation, certainly call for a closer investigation of their roles in relation to other sustainability performance frameworks.

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Article 3

Co-construction of performance indicators for a circular city and its relation to a local action net

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Abstract:

Purpose: This study examines how circular economy performance indicators are constructed in an urban context characterised by a multitude of conflicting interests and visions of urban development. It explores the process of constructing a shared consensus about the performance indicators in conditions of low contractibility (Speklé and Verbeeten, 2014), where intervention objectives and outcomes are not easily quantifiable because the object is ambiguous and cannot be fully specified in advance.

Design/methodology/approach: The construction of performance indicators at the urban level is examined through the lens of an action net (Czarniawska, 2004). Using group interviews, observations, and documentary analysis, this study investigates the case of a circular economy initiative in the city of Milan.

Findings: The study demonstrates that in cases of low contractibility, the development of circular economy solutions requires actions that span across organisational boundaries, organised in an action net. As the action net unfolds, it is closely knotted with the construction of performance indicators, indicating a co-constitutive relationship between the two processes.

Originality/value: This interdisciplinary study contributes to the public sector accounting literature by exploring the complexity of performance indicator construction at the urban level. It further recognises performance measurement in cities as a dynamic and flexible process, in which the interconnected actions and involvement of multiple actants shape the composition of the indicators.

Keywords: circular economy, performance measurement, city, action net, public sector accounting

Paper type: Research paper

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Introduction

Today, the majority of the world's population lives in cities and urbanised regions (UNCTAD, 2021), embedded in complex networks of private and public actors that influence citizens' well-being, the environment, and economy through policymaking (see Parisi and Bekier, 2022). This reality and its consequent impact on people's lives have motivated government policymakers and administrators to envision and plan cities and communities with a more sustainable profile—that is, urban spaces where individual and collective well-being is promoted through new forms of governance along with greater economic, social, and environmental sustainability (Argento *et al.,* 2020).

New approaches to urban sustainability, such as 'circular cities' (Prendeville *et al.,* 2018), 'smart cities' (Argento *et al.,* 2020), or 'flexible urbanism' (Burdett and Philipp, 2018) have gained popularity, inspiring initiatives that would render cities sustainable, resilient, and 'future-proof' (Prendeville *et al.,* 2018). What these approaches have in common are the requirements for broad stakeholder engagement and openness to innovation and uncertainty; however, their definitions are debated (Prendeville *et al.,* 2018). When it comes to a 'circular city', which we define as a city in which circular economy (CE) solutions are initiated and cultivated, the vision and objectives remain multifaceted and ill-defined (Corvellec *et al.,* 2020).

Essentially, CE solutions can be described as actions towards creating an economic system that eliminates waste by reducing, reusing, recycling, and recovering materials in the production and consumption processes (Kircherr *et al.,* 2017). Although the definitions of CE are multiple and evolving, there is an ongoing push from international organisations and policymakers for city actors to measure their progress towards more circular practices (see e.g. OECD, 2020). Such strong emphasis on performance management can be partly explained as an aftermath of the New Public Management (NPM) reforms (Lapsley, 2009), which advocated for the introduction of business-like management practices into the public sector (Hood, 1995). However, a consequence of this situation was the focus on a

single public entity or organisation creating and utilising performance measurement systems (Lapsley and Miller, 2019), rather than on accounting's role in a systemic change.

Consequently, performance was understood in terms of a contract that guides civil servants' efforts towards the pre-defined objectives (Bevan and Hood, 2006). This view came from the traditional embeddedness of performance management under organisational management control systems, where it served as a mechanism to control and manage the attainment of organisational strategy and its subsequent objectives (Otley, 1999). For this purpose, performance measurement requires conditions of high contractibility (Speklé and Verbeeten, 2014), meaning: (1) organisational goals are unambiguous and can be specified in advance, (2) the organisation can select or develop performance indicators that are aligned with its objectives, and (3) the organisational actors know and control the production function that translates efforts into results.

This specific view of performance contracting in public sector has been challenged because studies have observed that, in conditions of low contractibility, performance measurement systems can serve multiple operational, incentive, and exploratory goals (Speklé and Verbeeten, 2014). Nevertheless, little is known regarding how performance indicators are constructed in such situations, that is, when organisational objectives are ill-defined or unspecified and the effectiveness of various efforts is undefined.

This study argues that cities experimenting with CE principles present an extreme case of low contractibility. CE has been dubbed as an 'empty signifier' (Corvellec *et al.,* 2020) given the ambiguity of its vision and objectives; as a relatively new concept to the cities, CE requires innovation and experimentation (OECD, 2020) because its production function is yet to be defined; and given its highly complex and technical nature, CE often requires specialised knowledge to understand what 'good' performance is and how it can be measured. Simultaneously, the transition to CE in cities requires new organisational forms based on collaboration and co-creation (COM, 2020). Such emerging, collaborative forms of organising present

further challenges to the definition of a common vision and objectives and, consequently, to the formulation of relevant performance indicators. Therefore, we ask the following question: how are performance indicators constructed for 'circular city' initiatives?

First, it is important to investigate how such initiatives are organised in cities. Specifically, it is crucial to understand *whether* and, if so, *how* objectives are formulated in such settings, to further uncover how performance indicators are constructed in relation to this process. Accordingly, we follow Czarniawska (2004; 2010a) in problematising the city as a complex action net, that is, a set of collective, interconnected actions, transcending any formal organisation (Czarniawska, 2004). This approach allows us to study how the networks around CE solutions are formed and stabilised in the action net of a city and how performance indicators are constructed within them. It also allows us not to focus on a single entity within a public sector, which is the most common approach in public sector performance management literature (cf. Lapsley and Miller, 2019); instead, we illustrate the connections and translations required to fabricate performance indicators for a 'circular city'.

Following a CE initiative in the city of Milan, this study draws on sociology of translation to examine the interconnected actions, translations, and mediators (Czarniawska, 2004; Latour, 2005) involved in shaping the performance indicators for a circular city.

The remainder of this study is organised as follows. First, we review the developments in public sector and city accounting literature, to which we wish to contribute with this research. Thereafter, the study elaborates on sociology of translation and concept of action nets, which can be particularly useful in studying the city context. Next, the empirical setting and data collection methods are outlined. Subsequently, the findings related to construction of performance indicators in the European cities are presented. Lastly, the findings are discussed, followed by a conclusion and recommendations for further research.

Prior research - from NPM to accounting for the city

Performance measurement in public sector

While cities have been relatively neglected as research subject by management accounting scholars (Lapsley *et al.,* 2010), public sector accounting has received considerably more attention (see Lapsley and Miller, 2019). To identify potential avenues for studying calculative practices, and particularly performance measurement in cities, literature on management accounting in the public sector offers a starting point for our research.

In the last three decades, the NPM phenomenon (Hood, 1995) has influenced the practice and research agenda in the public sector (Arnaboldi *et al.,* 2015; Lapsley and Miller, 2019). The call to introduce more results-oriented, efficient practices in the public sector, taken from private sector experience, has created more space for accounting practice, including performance measurement (Arnaboldi and Azzone, 2010; Arnaboldi *et al.,* 2015). However, performance measurement practices, as advocated by the NPM, are rooted in a view of contracting, in which explicit and measurable performance targets are pre-set to guide civil servants' efforts in achieving defined objectives, creating sufficient incentives to align individual goals with overall objectives (Speklé and Verbeeten, 2014). Examining the Dutch public sector, Speklé and Verbeeten (2014) have pointed out that incentive-oriented performance contracting works best in conditions of high contractability, while a key issue identified in public sector research is the difficulty in defining targets given the multiplicity of goals and principals (Propper and Wilson, 2003). The NPM approaches to performance measurement in the public sector have been criticised and called for allowing more situation-dependent performance management (Speklé and Verbeeten, 2014). Moreover, several case studies have pointed towards the challenges in the implementation of performance measurement systems in the public sector (e.g. Modell, 2003; Arnaboldi and Azzone, 2010). Furthermore, NPM research has primarily relied on institutional theory, examining decoupled approaches to performance measurement in which

performance indicators are not directly linked to goals and objectives identified in advance (see Johnsen, 1999); most previous studies have focused on the roles of performance measurement in such situations. Thus far, the relevant literature has not investigated how performance indicators are constructed in such settings (see Modell, 2009).

However, critical accounting research has embraced and explored the constitutive nature of accounting in NPM (e.g. Preston *et al.,* 1992; Chua, 1995; Arnaboldi and Azzone, 2010; Bruno and Lapsley, 2018). Preston *et al.* (1992) have challenged the notion of budgeting and responsibility systems as 'well-defined technologies' in British healthcare and demonstrated the fragile process of their fabrication. Chua (1995) have followed the shifting interests in networks within Australian hospitals that 'experimented' with new accounting systems; Arnaboldi and Azzone (2010) have elaborated on the importance of controversies in translating performance measurement systems into practice. Bruno and Lapsley (2018) have provided insights into the complex and dynamic process of accrual accounting fabrication in regional government in Italy.

While each of these studies has extended our knowledge on fabrication of accounting in specific public sector settings, little is known about construction of performance indicators in the context of a city, where various stakeholders collaborate and organise beyond their own formal structures. As aforementioned, most studies have referred to a single public organisation instead of a complex network of actors, as is the reality within cities (Lapsley *et al.,* 2010). The literature on public sector accounting has encompassed publications regarding different levels of government (national, state or local), specific government agencies, state-owned enterprises, and major public sector institutions (such as health services or universities) (Lapsley and Miller, 2019), all of which indicate the roles and practices of accounting in the city.

However, the city can be conceptualised as a different object of study within the public sector accounting agenda. Therefore, we wish to contribute to the growing body of accounting literature dedicated to studying cities

(Lapsley *et al.,* 2010; Argento *et al.,* 2020; Parisi and Bekier, 2022). Accordingly, we recognise that accounting in general, and performance measurement in particular, can play significant roles in how the city management and operations are organised. Given that modern cities are exploring new approaches to public service delivery, not least in response to increasing levels of competition, resource constraints and marketisation (Argento *et al.,* 2020; Kornberger and Carter, 2010), the focus further turns to the quantification of impacts and outcomes of the city life.

Emergence of the 'accounting for the cities' agenda

For a long time, management accounting literature has remained relatively silent on the issue of cities. In 2010, a special issue of *Accounting, Auditing and Accountability Journal* was published and described as *'the first collection […] of papers concentrating on city management and accounting'* (Kornberger and Carter, 2010, p. 326). The studies included in this special issue proved the potential for management accounting research to address various aspects of the city, ranging from asset (Arnaboldi and Lapsley, 2010) and strategic managements and competition (Kornberger and Carter, 2010), to representations and 'visions' of the city (Lapsley *et al.,* 2010).

The complexity of accounting for the city is particularly highlighted in the case of an urban project in Rome, described by Czarniawska (2010a). Their study has suggested that following the chain of translations from a political decision to actual events in the city is a difficult, if not an impossible challenge; however, they have also pointed accounting researchers towards the benefits of conceptualising city management as a construction and maintenance of an action net (Czarniawska, 2010a). The multitude of actors and actions involved even in a specific project, makes historical mechanisms of accounting for the city nearly obsolete, where changes and visible results of city initiatives are documented using new communication means such as websites and blogs, instead of formal accounting systems (Czarniawska, 2010a).

Building upon the aforementioned literature, our study investigates the creation of performance indicators in a complex action net of a city. Instead of political decisions and their translation into practice, we observe the vision and objectives of a 'circular city' co-created in a chain of actions together with the parallel process of fabrication of performance indicators. Given that CE is being increasingly observed as a strategy used by cities to improve their overall sustainability (Prendeville *et al.,* 2018) and remain competitive (Kornberger and Carter, 2010), understanding how performance indicators are defined in this context has become particularly relevant. Moreover, this study can provide a greater understanding of how cities, and city initiatives, respond to pressures of measuring and reporting performance on issues that are vague and ill-defined. The next section highlights CE-related concerns in urban planning and city management, which could potentially make accounting for the city even more challenging.

Circular cities and the issue of performance measurement

CE is slowly entering the accounting research domain (see Marrone *et al.,* 2020; Larrinaga and Garcia-Torea, 2022; Parisi and Bekier, 2022), with journals like *Accounting Forum* (Arjaliés *et al.,* 2020) or *Accounting, Auditing and Accountability Journal* (Lapsley *et al*., 2010) dedicating special issues to the topic. Considering that the concept is hardly novel (cf. Prendeville *et al.,* 2018), many definitions and conceptualisations of CE have emerged throughout the years. Although numerous examples exist in practice, no generally accepted definition exists within academia.

Kirchherr et al. (2017) attempted to consolidate existing definitions of CE from academic and practitioner literature, resulting in the development of a broad conceptual foundation for working with CE. They have defined it as *'an economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling, and recovering materials in production/distribution and consumption processes. [CE] operates at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, thus simultaneously creating environmental quality,*

economic prosperity and social equity, to the benefit of current and future generations.' (Kirchherr *et al.,* 2017, p. 229).

The concept of CE has been criticised as incomplete and idealistic (Prendeville *et al.,* 2018), providing only a partial agenda with 'unrealistic' and 'unclear' goals (Gregson *et al.,* 2015). It has been described as an 'empty' concept that allows for a multitude of approaches and interpretations to be bundled together under a generic term (Corvellec *et al.,* 2020). CE and its narrative have focused on 'value creation', 'resource efficiency', and 'economic growth', and have been regarded as particularly well-suited for businesses, especially at the 'micro' level of transition (referring to a single company or consumer; Ghisellini *et al.,* 2016) and not for the public sector, especially at the 'meso' and 'macro' levels involving various stakeholders characterised by conflicting interests (referring to eco-industrial systems and cities, regions, and nations; Ghisellini *et al.,* 2016). Considering these limitations and the manifold issues of public governance, city-level implementation of CE has been particularly challenging.

Nevertheless, cities continue to adopt policies and implement initiatives that could support their transition to a 'circular city' to address the sustainability agenda (Prendeville *et al.,* 2018) and increasing competitive pressures (Kornberger and Carter, 2010). Accordingly, cities follow numerous recommendations and guidelines that emphasise various aspects and visions of CE, published by international organisations that have been dominating the global CE discourse (Corvellec *et al.,* 2020). Differences in definitions of CE present a challenge for the development of performance indicators because they need to be adapted to fit the local context and address the needs of different stakeholders (Sobkowiak *et al.,* 2020).

While definitions of CE differ, recent studies have confirmed that changes in production and consumption patterns and infrastructure investments are required for cities to transition towards CE (Prendeville *et al.,* 2018); however, their achievement is dependent on factors such as political leadership, active engagement with the city's stakeholders, development of

a long-term adaptable vision, and openness to experimentation (Prendeville *et al.,* 2018).

Implementation and management of CE initiatives also require consideration beyond the spatial and temporal boundaries (Korhonen *et al.,* 2018). As material flows cross organisational and geographical boundaries, the impact of local intervention can be observed on other, distant locations. Similarly, investments in CE initiatives can provide benefits years or decades after the initial decision. Thus, CE implementation must go beyond a single organisation, and, at minimum, be based on inter-organisational cooperation (Korhonen *et al.*, 2018). At the city level, top-down and bottom-up involvement are needed for the transformation, including political and institutionalised actors, social movements, and entrepreneurial activity (Prendeville *et al.,* 2018).

Given these considerations, conventional ways to define performance indicators may be ineffective when the objectives are ill-defined and the initiative transcends organisational boundaries, as is in the case of CE. Consequently, new ways of devising indicators may emerge. Therefore, our study investigates how performance indicators are developed in, and for, a circular city.

Theoretical framework

In this study we explore how cities handle performance measurement of CE. Particularly, we examine how performance indicators are constructed for CE initiatives in cities and how this process relates to other actions required for the development and implementation of such initiatives. This study aims to expand the knowledge on development of CE performance indicators in a city setting, mapping the actions and 'connecting points' (Czarniawska, 2004, p. 783) at which translation takes place, leading to the construction of performance indicators in a complex action net.

Organizing collective action—a lens of an action net

Cities have been recognised as complex settings with messy realities (Stafford et al., 2020) in which a multitude of actors coexist, representing conflicting interests, time horizons, and visions of urban development (Zapata Campos and Zapata, 2012). Simultaneously, CE initiatives require collaboration and cooperation that transcend organisational boundaries. At the city level, this calls for various organisations and groups to work together in an organised manner to develop, prototype, and realise solutions designed in line with the CE principles (Prendeville *et al.*, 2018).

Cases in which different collective actions are connected and performed in certain patterns for a certain objective can suggest the existence of an *action net*. The concept of action nets has proven useful in studying city management (Czarniawska, 2002), accounting for a city initiative (Czarniawska, 2010a), city organising (Zapata Campos and Zapata, 2012), and public sector accounting (Bruno and Lapsley, 2018). However, it is yet to be mobilised in studying the construction of performance indicators and their relation to other actions in the city context. In this study, we rely on the following definition of an action net:

'Action nets are understood as assemblages of collective actions, connected to one another because they are perceived, within a given institutional order, as requiring each other; or, if new, because they are perceived as effective means of accomplishing a goal that lies outside the present order' (Corvellec and Czarniawska, 2014, p. 89).

Action nets differ from organisations and networks. Organisations refer to legal entities, that is, units with formalised boundaries. Networks describe connections between well-defined points, which do not necessarily need to engage in any joint action. Only the occurrence of actions to be performed, coordinated, and connected to each other signifies an action net (Czarniawska, 2010a). Thus, formal organisations emerge from action nets, comprise several action nets, and are potentially included in several action nets (Lindberg and Czarniawska, 2006). City management is an example of a large action net—a joint action that requires organising *among*

organisations, instead of within them (Czarniawska, 2010a, 2010b). Although each city is 'equipped' with a formal organisation in the form of a city administration, nearly any activity performed in the city requires not only the political and productive involvement from the city administration, but also cooperation between the many other organisations that exist within the city including private businesses, NGOs, other public institutions, or voluntary associations).

Using action net to study cities

Following the methodological and analytical approach of action net studies (see Czarniawska, 2002, 2010a; Lindberg and Czarniawska, 2006; Zapata Campos and Zapata, 2012; Dembek, 2020), we study the construction of performance indicators as a process connected to the development of CE solutions in which the vision and objectives of a CE initiative are collaboratively defined. Accordingly, this study examines the following questions: *'What is being done?' and 'How does this connect to other things that are being done in the same context?'* (Czarniawska, 2004, p. 784). Based on this, we uncover how performance indicators for CE are constructed and connected within a city action net.

Studying action nets requires analytical focus on *actions*. An action can be defined as *'a movement or an event, to which an intention can be attributed by relating the event to the social order in which it takes place'* (Czarniawska, 2004, p. 782). Accordingly, this study follows the events identified as necessary for development of CE solutions in a city initiative. A study of an action net also requires focus on *knotting*, that is, connecting between various actions, where emphasis is on the *connecting points* at which actors or objects—things or technologies (Lindberg and Czarniawska, 2006)—mediate between the actions. In studying the connecting points, we inherently mobilise the concept of translation (Czarniawska, 2004; Latour, 1987, 2005).

Translation is used to reflect the ways in which actions are brought together and new traceable associations between actants (human or non-human) are produced (Latour, 2005). Consistent with Czarniawska (2010a), we

recognise that *'in any city there are a great many translators of events into words, pictures and numbers (…). Some of these translations connect actions, contributing to the process of organizing in the city; some have no effect; and some are clearly detrimental'* (Czarniawska, 2010a, p. 421). Our study focuses on the translations that shape the performance indicators of a circular city initiative, and the translations of performance indicators that shape the actions in the complex action nets they are embedded in.

Our focus on actions and how they are connected also points us to study the mediating power of actants (Latour, 2005), allowing us to recognise that mediators might be present at certain connecting points in an action net (Latour, 2005). Mediators are referred to as actants that *'transform, translate, distort and modify the meaning or the elements they are supposed to carry'* (Latour, 2005, p. 39). Accordingly, we pay particular attention to the actors and objects engaged in the construction of performance indicators, the associations that create these entities, and the traces they produce (Latour, 2005, p. 79).

Following studies on management accounting influenced by sociology of translation, we observe various types of 'boundary objects' that mediate diverse interests within networks (Briers and Chua, 2001). In the complex context of a city initiative, we expect to observe various actants behaving as mediators. In this investigation into the development of performance indicators, which is an innovation that requires numerous meetings, negotiations, and trials, the mediators can be particularly visible before turning to *'invisible, asocial intermediaries'* (Latour, 2005, p. 80). In our study, we share the perspective that mediators are not limited to humans and can extend to non-human actants (Latour, 1987), such as accounting technologies and calculative devices.

Research context

Adopting a case study approach (Stake, 2000), this study follows the emergence of an action net in the city of Milan, examining how performance indicators are constructed and embedded in this setting. Specifically, we

observe how performance indicators are constructed across formal organisational boundaries, when organising is based on connected collective actions and the common objective is unclear and ambiguous (an inherent feature of CE initiatives—see Corvellec *et al.*, 2020; Gregson *et al.,* 2015).

Our starting point is a group of Milan city stakeholders participating in a large-scale European Union (EU) project focused on supporting the city's transition to CE. The group constitutes one of six 'pilot cities' from the EU project, which aims to develop and test innovative solutions over a three-year period to transform the linear flow of materials (the 'take-make-dispose' model) into a more circular one. As a pilot city, Milan focuses on the food system and attempts to create sustainable and long-term solutions for *'the logistics, transportation, transformation, distribution and conservation of food'* (Project Internal Document, 2020). Four organisations from Milan are formally enrolled in the EU project—the municipality office, an academic institution, and two makerspaces (also called Fab Labs, defined as workshops that provide public access to tools and skills). However, the core group extensively collaborates with the external stakeholders, including private sector organisations, NGOs, citizen associations, and public institutions.

Thus, Milan presents an exemplary case of a circular city project in which actors collaborate to achieve top-down (policymaking) and bottom up (social innovation) development to create more circular practices (Prendeville *et al.,* 2018). Within the project, the pilot city of Milan is supported by a network of various organisations, all located in the EU and specialising in various topics including technology, material engineering, governance, and business and process management. Ultimately, we observe many actants rooted in clearly demarcated units (various organisations and groups they are part of) that are required to cooperate in order to fulfil the vision of a circular city. This amount of cooperation requires connections that transgress organisational and professional boundaries and can be studied as an action net (Lindberg and Czarniawska, 2006).

At the onset of the EU project, the pilot city of Milan was provided with nine performance indicators to guide their efforts and ensure accountability to the European Commission. However, during the first two years of the project, the pilot city could adjust these indicators and even formulate their own, in addition to the ones proposed by the formal project contract. While the city has been supported by one of the consulting firms and the academic institution, it had full autonomy in developing the performance indicators. In this study, we observe this process in parallel with actions required to develop the solutions for a circular city, aiming to expand the existing knowledge on performance indicators construction and its relation to the larger action net of the city.

Methodology

Studying action nets requires following the actions and chain of translations between them (see Lindberg and Czarniawska, 2006; Czarniawska, 2010). As *'action nets need […] to be observed as they are being established and re-established'* (Czarniawska, 2004, p. 782), the data collection took place in a 24-month period between late 2019 and 2021. The timing of data collection was intentional because it corresponded with the timeframe given to the pilot cities in the EU project to develop their performance indicators. In our approach, we remained open to multiple data sources, such as field observations, documents, and semi-structured interviews. This allowed us to obtain varied accounts and study the KPI development process from many angles (Gioia *et al.,* 2012).

Having full access to the project's internal document and meetings, we were able to familiarise ourselves with the inner workings of the different teams and project members based on observations from meetings and documentary analysis. As formal members of the project, we observed formal meetings and informal discussions and accessed project documents, informal notes, comments, and information shared via online communication channels. This flexibility in data collection allowed us to remain alert to new, emerging evidence and pursue avenues important to our research question (Scapens, 2004). For this study specifically, primary

data collection involved 132 hours of participant observation in meetings and workshops, and nine interviews, including group interviews (Fontana and Frey, 2000). The details of data collection are presented in Table 1.

Interviews			
Interview type	**Date**	**Interviewees**	**Duration**
Group interview	08/01/2020	Municipality employee 1 Municipality employee 2	1h
Group interview	06/10/2021	Municipality employee 1 Municipality employee 2 Fab Lab member 1 Fab Lab member 2 Fab Lab member 4	1h
Group interview	08/11/2021	Municipality employee 1 Municipality employee 2 Fab Lab member 2 Fab Lab member 3 University employee 1	1,5h
Group interview	08/11/2021	FabLab member 1 Fab Lab member 2 Fab Lab member 3 Fab Lab member 4 NGO member 1 NGO member 2 Municipality employee 1 Municipality employee2	1,5h
Group interview	09/11/2021	NGO member 1 NGO member 2 Municipality employee 1 Fab Lab member 1	1h
Individual interview	23/09/2022	Municipality employee 2	30min
Individual interview	23/09/2022	Fab Lab member 2	35min

Individual interview	27/09/2022	Municipality employee 1	50min
Individual interview	10/11/2022	Fab Lab member 1	30min
Observations			
Meeting type	**Period**	**Number of meetings**	**Total time**
KPI development process design	2019-2020	3	6h
KPI development process	2020-2021	4	5h
ToC development process	2020-2021	4	5h
Milan city team – meetings with project partners	2020-2021	4	6h
Milan city team – meetings with local stakeholders	2021	4	14h
Project workshops and meetings	2019-2022	18	72h
Steering Committee meetings	2019-2021	9	9h
Other meetings	2019-2022	10	15h
TOTAL:			132h

Table I. Details of data collection. Table by authors.

The observations were primarily carried out at project meetings related to KPI development and development of solutions in the Milan pilot team. The former included the following types of meetings: (1) KPI development process design, in which the teams of experts in the project discussed and

agreed upon the indicator construction methodology to be implemented in the participating cities; (2) KPI development process, in which the pilot city team discussed and negotiated their final sets of indicators. The latter observations focused on two types of meetings, namely (1) Theory of Change (ToC) development process, in which the pilot city iteratively described the plans for their interventions and reflected on the performance indicators' fit, and (2) meetings with EU project partners in which solutions were discussed and altered.

As part of the ongoing field engagement, other meetings observed included project workshops, steering committee meetings, and more informal check-ins in which the topics of KPIs and performance measurement were frequently addressed. The recordings of these meetings were transcribed and supplemented with field notes and various documents that were either created or brought into the discussion during this stage. If recordings were not available, that is, when meetings were held in person, extensive field notes were taken.

To supplement the participant observations, individual and group interviews (Fontana and Frey, 2000) with the city team were conducted; one at the beginning of KPI development, and eight once the process was concluded. The initial interview aimed to understand the city's context, local connections, and vision for circularity. The latter interviews aimed to capture more nuance and clarify some of our observations, allowing us to better understand which actions impact the KPI development from the city teams' perspective. The exploratory group interviews helped us further observe how different tensions and interests played out in the team setting, which is something that could not be observed in the individual interviews (Fontana and Frey, 2000). The interviewees were purposefully selected as key actors involved in the process, to explain the emerging action net and process of constructing performance indicators.

Secondary data sources included formal documents, such as the project proposal, project contract, various reports and project deliverables, and other internal documents, such as meeting notes, report drafts,

presentations, e-mails, and other written communication. Additionally, we studied various artefacts created and mobilised in the project in relation to KPI development, such as graphs (e.g. developed and iterated on online whiteboards), spreadsheets, and other forms of visualisation.

All data were coded by both the authors to control for subjective biases that could skew the analysis (Flick, 2018). Two rounds of coding were conducted. The first round included open coding to search for themes emerging from the data, which helped us discover patterns of actions within and around the KPI development process. The second was a directed content analysis (Hsieh and Shannon, 2005) using concepts drawn from action net approach and applied as codes (Czarniawska, 2004; Lindberg and Czarniawska, 2006). During our study, we 'cycled' between emergent data and relevant literature (Gioia *et al.,* 2012), subscribing to the abductive research approach (Alvesson and Kärreman, 2007).

Research results

The following sub-sections present how performance indicators have been constructed by the Milan city team participating in the European CE project. First, we describe how the project team members organised themselves and actions required to arrive at CE solutions. Subsequently, we describe how the construction of performance indicators unfolded, intertwining with the various actions identified as crucial for CE solutions development.

Circular economy in cities requires co-creation

CE is known to be a contested concept (Korhonen *et al.,* 2018; Gregson *et al.,* 2015) that has different meanings for different people (Kirchherr *et al.*, 2017). It is recognised that the development and implementation of CE solutions require collaborative interventions; particularly in cities, this collaboration unfolds across different levels (Prendeville *et al.* 2018). In the EU project observed in this study, the city teams relied on collaboration and knowledge exchange within their own teams, with the EU project

consortium partners, and with external actors at the local, national, and international levels.

The approach towards designing CE solutions and their implementation strategies has been described in the project as *'a large-scale co-creation effort, in which municipalities, SMEs, makerspaces and citizens collaborate to bring new value for CE in urban contexts'* (Project deliverable D1.1., 2020, p. 20). Here, co-creation was understood as active involvement of stakeholders with different competencies and interests in re-thinking and re-defining how certain products or services are provided in the city. In other words, it assumed joint and collaborative definition of the changes that were desirable and how they should be implemented. Beyond the collaborative definition of objectives and strategy, the overall co-creation framework defined in the project also assumed stakeholder mobilisation in co-design (engagement in the solution design process) and co-production (engagement in the implementation and delivery of the solution).

In the Milan city team investigated in this study, the understanding of CE and desired changes varied among different actors. For instance, the Municipality representatives largely related CE with its potential for sustainable economic impact, stating the following: *'We look at it from this point of view – that CE could be a foundation to develop new projects and ideas, to develop urban economies'* (Municipality employee 1, Group interview, 08-01-2020). Conversely, makerspace members emphasised the redefinition of material flows, potential waste reduction, and other environmental impacts. In a project exercise, where all team members participated in mapping the envisioned change, CE was related with environmental, social, and economic aspects ranging from 'reduced emissions' and 'increased recycling rates' to 'open innovation possibilities' and 'cohesive communities' (Project workshop, Observation notes, 1-07-2020).

To accommodate various interests and desired impacts, the first 'common' vision, presented on different occasions by the project team, was purposefully broad and all-encompassing, simply referring to the development of a 'circular food system rooted in municipal markets'

(Project workshop, Observation notes, 23-09-2020). The intended outcomes and impact changed throughout the project in the Milan city team. To leverage the participation of different stakeholders and ensure a multi-level collaborative process, the team identified key actions required for defining objectives and implementing CE solutions. For the Milan team, it was important to identify actions that would allow reflexivity and flexibility of the objectives, providing *'the capacity to change ideas during the process, to see how the process is going, and to change the goals and ideas during the project'* (Municipality employee 1, Group interview, 08-01-2020).

Organizing co-creation—emergence of an action net

As a result, the co-creation model emerged. The model consisted of a sequence of three key actions that were required to trigger meaningful change; these actions were arranged in what we identified as an ideal action net (Lindberg and Czarniawska, 2006) in which cross-organisational collective action was to be achieved. Each of these three actions was required to develop CE solutions in the Milan city initiative. The actions were coordinated by the Milan city team participating in the European project; however, more actors performed these actions, inherently becoming co-creators, co-designers, and co-producers of the CE solutions in their city (Czarniawska, 2010a).

The first action was referred to by the Milan city team as 'stakeholder engagement, mapping, and research grounding.' At the beginning of the project, one of the team members explained that this action was crucial to the definition of CE in the local context of food systems and objectives of the project. They stated that, *'[what we do] is an interesting experiment, because we try to translate a general concept of CE into a specific need, a specific activity that we can create in the marketplaces. So, the barrier is really the difficulty to identify the needs correctly, to arrive at the real needs of the citizen'* (Municipality employee 1, Group interview, 08-01-2020).

Therefore, the idea was to map out stakeholders relevant to the urban food system in Milan and engage in extensive dialogue to understand their

everyday needs, and to consequently co-create objectives of the project. Another team member reflected on the importance of this action after the project was completed, saying that, '*stakeholder engagement for us was very important, because it was a kind of action research phase. We used it to onboard people and define the typology of stakeholders, but it was also the phase in which we built our objective. So, it has been a strategic phase.'* (Municipality employee 2, Interview, 23-09-2022).

The subsequent action involved arranging co-design 'labs' (workshops) to ensure collaborative and participatory development of specific solutions. Once the problems were identified and objectives were established through 'stakeholder engagement, mapping and research grounding', the action of co-design aimed to translate them into more operational ideas. Accordingly, the two actions were closely 'knotted' together (Lindberg and Czarniawska, 2006), with connections assuming different forms including formal contracts (the EU project contract laid the ground for involvement of specific partners) and informal agreements based on common interest (most stakeholders' involvement was voluntary, with the intention of addressing a common need). Images and inscriptions served as connecting points in translating the results of the stakeholder engagement, mapping, and research grounding into a specific design (Latour, 1990). Specifically, the Milan city team used an online whiteboard tool called 'Miro' to translate the knowledge gained from the first action into a visual map indicating how food flows from and within the wholesale market. With Miro, the resource flows were expressed with different shapes, colours and text, and connections were drawn between various items. This served as a foundation for the co-design workshops:

'For the co-design workshops, we created a tool – we designed a value flow map of how the food chain worked in [the wholesale market] and outside of it. We designed it on Miro, we highlighted everything, and we tried to use the circularity ideas in it as well. […] And through that tool, we were able to understand the problems, understand where we would act. And that is also something that helped us a lot in solution development, and specifically to deal with technological development. It helped us in translating [the

idea] from a value flow into technology.' (Fab Lab member 2, Interview, 23-09-2022)

The possibility of visualisation was a powerful advantage of the online whiteboard and a key reason for its use. Given the multidimensionality of CE (Kirchherr *et al.,* 2017), and need for various tools and processes to operationalise it on a local level, visualisation was deemed helpful in establishing connections. One team member stated that, *'We are trying to have a vision with different layers, and each layer adds to the understanding of what we are doing. In that, we can use different tools to map them – and maybe visualizations like Miro are helping us to better see connections between the different aspects of the project*' (Municipality employee 2, Milan city team – project partners meeting, 02-07-2020).

Without the visualisations on online whiteboards, the solutions developed by the Milan team would have looked different. In that sense, Miro played an important role as a non-human actant (Latour, 2005) that allowed for codification and mapping of knowledge, leading the team to take specific decisions within their action net. Miro, together with other inscriptions, was key in facilitating the actions and establishing durable connections between them as they provided a tangible, material object for the action net (Lindberg and Czarniawska, 2006).

Beyond translating the collective insights into operational ideas, the co-design workshops also helped create a feeling of inclusion and ownership towards the solution among involved stakeholders. This was based on the recognition that such engagement would '*make the stakeholders active participants in the solution*' (Project workshop, Observation notes, 05-02-2020). We observed that the participants to action of co-design acquired the identity of co-designers (Lindberg and Czarniawska, 2006). They became co-designers because they could provide what was required to design the CE solutions for the food system in Milan. The solutions—albeit in different form—would have been developed regardless of the individual actors, and in that sense, the action net would change only slightly (Lindberg and Czarniawska, 2006).

Lastly, the co-design was translated into prototype experiments as '*a way to further validate and iterate the solution'* (Project workshop, Observation notes, 23-09-2020). The prototype workshops were conducted near the very end of the project, aiming to create a working prototype for each solution developed, test it in practice, and make necessary adjustments given the input of stakeholders involved. Similar to the co-design workshops, the visualisations—graphs demonstrating food flows in and around the Milan markets—were a key connecting point for aligning stakeholders on the solution developed. However, the visualisations could not work in isolation to translate the data and knowledge into practice.

Given their skillset and competencies in industrial design, Fab Lab members played an important role in this translation, as they could translate the data collected into a concrete operational solution addressing food waste. One of them stated that, *'there is very little culture about data when you speak with the stakeholders. At least that's our [Fab Lab] experience. Data is not seen as a design instrument, and it's not seen as something that you can use to understand how to improve your circularity. So, the visualization of the material flows gave a bit of that sense in my opinion.'* (Fab Lab member 2, Group interview, 6-10-2021). Accordingly, the Fab Lab members were key mediators, utilising the visualisations of material flows as a kind of boundary object (Star and Griesemer, 1989) that helped to stabilise the emerging action net (Lindberg and Czarniawska, 2006).

The need for a co-creation of specific solutions and a participatory and collective definition of objectives for a circular food system in Milan resulted in challenges to the definition of the performance indicators. Given the multiplicity of actors involved, their contrasting interests (cf. Arnaboldi and Azzone, 2010), and lack of pre-defined objectives, which could have guided the efforts of city stakeholders (cf. Bevan and Hood, 2006), it was important for us to first identify the action net that led to the development of common objectives in the project. Accordingly, we proceed to describe how performance indicators were constructed in relation to this process.

Indicator development process aligned with co-creation

To provide a rich account and in-depth understanding of how performance indicators were constructed in relation to a broader action net in a circular city initiative, it was important to trace their beginnings. The investigation led us to the project Grant Agreement, which, to a certain extent, guided the activities of the EU project members. The Grant Agreement was first constructed as a written project proposal by participating project members; once it was approved by the European Commission, who funded the project, it became a binding contract. As the project's formal contract, it outlined the key tasks, milestones, and deliverables required for the project's successful conclusion, and as such it served as a foundation for performance indicator development. However, already at the stage of project proposal writing, which lasted around two years before project commencement, the involved actors kept shifting, introducing various interests and understandings into the emerging project contract.

After the process of negotiation, the first 'account' of the project and envisioned city initiatives emerged. Consequently, an inscription was created (Latour, 1990) that codified the different interests in writing and became a reference point for future actions and convincing of others to own interests. The inscription (that is, the Grant Agreement also provided a preliminary foundation for constructing performance indicators in each of the city initiatives.

More specifically, the Grant Agreement assumed the development of *'a core set of urban-specific circular principles and key performance indicators (KPIs) to be shared across all pilots as well as calibrated to each pilot's local context'* (Project Internal Document, 2019, p. 18), pointing towards a joint interest in measuring performance of the circular city initiatives. However, the Grant Agreement did not prescribe how the development of context-specific indicators should be organised. Ultimately, the performance of Milan and other participating cities was measured and evaluated based on a set of KPIs constructed by each city team on the basis of the 'proposal KPIs,' which

were included in the Grant Agreement, and 'co-constructed KPIs', which have been developed following a separate process.

The proposal KPIs referred to a list of nine performance indicators suggested by the cities and other project members in the project proposal writing stage. Once formalised, the Grant Agreement became thus a powerful actant, driving a specific agenda and impacting actions taken on its basis. Simultaneously, for the city team in Milan, responsible for development of CE solutions on the local scale, these KPIs can be interpreted as objectives pre-defined to guide their efforts towards an overall project strategy (Bevan and Hood, 2006; Otley, 1999). The proposal KPIs for the Milan city are presented in Table II.

Performance indicator	**Target**
Number of agri-food specific city resources identified (materials, infrastructures, etc.)	150
Number of specific agri-food streams identified	30
Number of governance / business models developed	6
Percentage of food regenerated (current: 20% of complete stream)	25%
Overall stakeholder satisfaction with new models	75%
Number of new applications for food stream developed	6
Willingness to pay for regenerated products and materials	75%
Number of local makers and businesses reached through showcases	250
Number of citizens engaged through educational programmes	500

Table II. Proposal KPIs for the Milan pilot city. Table by authors.

However, the ideal action net for developing CE solutions in Milan was defined based on a perceived necessity for a multi-level collaborative

engagement of various stakeholders in a broader system of co-creation. It rested on the idea that collaborative development of objectives and strategy will reduce, if not eliminate, the issue of CE having multiple meanings (Kirchherr *et al.,* 2017). In this setting, instead of providing direction, the proposal KPIs became contested by Milan city team and considered ill-fitted to how their plans and visions for the circular city were unfolding. The KPIs defined at the project proposal writing stage did not correspond with the actions later identified as essential to the development of solutions for circular food flows in the city. Thus, in situations of low contractibility (Speklé and Verbeeten, 2014), such as circular city initiatives, setting pre-defined performance indicators may be an unavailing effort. As one of the team members reflected, the proposal KPIs could still be mobilised, but not in a meaningful way because the scale of interventions and their objectives were still under development. They stated that: *'If I need to take the indicators that we have drafted in the proposal – for example, 'percentage of food regenerated'. At that moment nothing was clear enough to formulate smart indicators. But alright, if I need to use this indicator, and let's say I choose a scale – I choose to make an experiment in Milan with 2kg of bread and I can say honestly that I have the 20% of the bread reused. But it's not interesting, because maybe the KPI fits something but it's not the scope of the project'* (Municipality employee 2, KPI calibration workshop, 08-03-2021). Thus, they suggested that in situations in which the objectives are not stabilised, the performance indicators should be iteratively constructed, closely linked to the actions of co-creation, co-design, and prototyping:

'So, my approach would be to look beyond these KPIs to the action plan, to the scenarios, the concepts, our stakeholders, the iterative way we are working on... and at the end maybe we need to reinterpret some of these indicators accordingly to what we are doing. […] Because what we do as a pilot is more experiments, prototypes – they are not supposed to have an impact in that sense, and on that scale. So, it's a matter of defining an approach, where we try to reframe and replace the indicators from the Grant Agreement with other indicators that consider the issues from the pilot point of view.' (Municipality employee 2, KPI calibration workshop, 08-03-2021).

What followed was a period of performance indicator development. The process was designed by two organisations participating in the EU project and supporting the pilot city teams. Accordingly, the process aimed to fulfil the objective for KPI development set out in the Grant Agreement and pilot team's request for more locally relevant KPIs. The approach intended to draw on performance indicators, which exist in global CE frameworks (see OECD, 2021), and translate them into a contextually relevant and applicable set of indicators using a series of workshops and a survey circulated among city stakeholders. The KPIs were also discussed by the pilot city team and mobilised in discussions with their stakeholders at different points in the co-creation of solutions. Ultimately, the goal of this two-year process was to develop indicators that *'fit best cities' action plans and their priorities'* (Consultant 1, KPI strategy meeting, 03-02-2020). The process prescribed specific phases, such as 'longlisting', 'shortlisting', and 'calibrating', to support the cities in establishing their own performance indicators.

Co-construction of performance indicators in a circular city initiative

The first step in the development of performance indicators was identifying the 'impact areas', which the cities participating in the EU project considered to be a priority in the transition to a circular city. In late 2019, in a project workshop, Milan and other city teams agreed upon 12 impact areas common to all cities, ranging from '*materials and resources'* and *'air quality'* to '*community participation*' and '*behaviour and lifestyles'* (Project workshop, Observation notes, 21-11-2019). These categories represented the initial considerations of the impacts the cities can achieve. The categories were kept broad to accommodate cities like Milan, who were just embarking on the co-creation efforts.

The definition of potential impact areas was an important exercise in which the Milan team could communicate the intermediate results of their stakeholder engagement, mapping, and research grounding, while simultaneously reflecting on and articulating their own visions of a circular city and feeding them back into the co-creation of circular solutions in

Milan. Therefore, the action of defining impact areas was connected to co-creation, whereby knowledge was translated into the definition of impact, and the jointly defined impact areas were further translated into potential solutions. Meanwhile, the two organisations coordinating the KPI development process drew on this exercise while researching the indicators in international frameworks that could fall under these impact areas.

The 'longlisting' process was conducted by the two organisations coordinating the KPI development process. Both of them relied on the following three key sources of available performance indicators for CE in cities: (1) EU directives, (2) global indicator databases defined by international organisations, and (3) literature review of academic papers. Ultimately, the longlist of performance indicators consisted of 125 indicators, categorised under the 12 previously defined impact areas.

For Milan, the coordinating organisations highlighted 62 performance indicators, which had the highest potential relevance to solutions regarding circular food systems. The action of selecting indicators from various sources was not directly connected to the co-creation of CE solutions in Milan. However, we observed that the output of this action—an Excel spreadsheet that has been colour-coded for various impact areas and had dedicated tabs for each of the cities participating in the European project—emerged as a powerful actant. It shaped further discussions and convinced others towards certain courses of action. The longlist was also acted upon, with the Milan city team and organisations coordinating the KPI development process by adding new or modifying its existing elements.

In the next step, the 'shortlisting' of KPIs, the city teams were asked to review the longlist and select indicators most relevant to their context. The 'shortlisting' was to be completed when Milan city was engaging with the stakeholders and conducting mapping and research. Although the city team members participated in the workshop to envision potential impact areas for circular cities and provided inputs, the shortlisting of KPIs according to the different impact areas proved to be a difficult task. One team member said that, '*we cannot define the relevance of different impact areas at this point, since they*

[impacts] depend on the activities and solutions we choose, and we are not there yet' (Academic researcher 1, KPI shortlisting workshop, 26-02-2020).

The team members became more comfortable with making a preliminary shortlist only when they were reassured that the shortlisting exercise did not imply a final selection, that is, the indicators could be further developed, adjusted, or even removed from Milan's KPI list. However, the selection was based on a broad understanding of the Milan city's vision for food circularity. Lacking a clear set of solutions and objectives, the team members made the following suggestions based on their own preferences: '*regarding 'Air Quality' impact area, it's relevant if we'll have a solution, for example, about food delivery and a group of vendors that can work together towards that. Personally, looking through the list, I think 'Behaviour and Lifestyle' and 'Health and Well-being' could be interesting in relation to agri-food local chains, considering the healthy food and direct impacts of eating healthy food. […] More from the municipality point of view, "Governance and Policy" areas would be interesting for us. But maybe we need to speak about this in the next weeks within our team […]'* (Municipality employee 1, KPI shortlisting workshop, 26-02-2020). In the end, 10 additional indicators were selected (see Table III).

Performance indicator	**Target**
Circular food use rate	-
Food waste index	-
Material import dependency	-
Increased consciousness of citizenship	-
Number of stakeholders involved in activities	-
Number of people reached	-
Citizens' awareness regarding urban nature and ecosystem services	-
Extent to which the project serves to promote a healthy lifestyle among local residents	-

Policy learning concerning adapting policies and strategic plans	-
Quality and frequency of dialogue between and among domestic and external stakeholders	-

Table III. A shortlist of additional KPIs selected by the Milan pilot city team. Table by authors.

These indicators were taken verbatim from the sources that the two coordinating organisations relied on when creating the KPI longlist for the project. These sources—the EU directives, global indicator databases, and academic literature—not only participated in the action of constructing performance indicators, but also played a powerful role in shaping them when local objectives were still under development. Thus, the indicator lists from organisational and academic sources affected the Milan city team's action of constructing performance indicators, presenting themselves as important non-human actants instead of mere objects (Latour, 2005). The organisations selecting the sources (who here 'speak in one voice', although their individual members likely have their own claims) also had a vast influence on the final form of indicators, delimiting the boundaries of the longlist.

The next step in developing performance indicators was 'calibration'. Here, the city team was asked to adapt the indicators selected by them into the context of their activities. The calibration of indicators also included the definition of units of measurement, scale of measurement, monitoring rates, and targets for each of the indicators. During the first 'calibration workshop', which took place the same time as the co-creation action in Milan, the city team adapted the shortlisted indicators. The additional knowledge gathered at this point using stakeholder engagement, mapping, and research, was translated into the new version of indicators. Various options were considered and debated—for instance, when an additional KPI was suggested to track the *'Number of customers of products derived from local supply chains'*:

Municipality employee 2: *In my view, we would need to reframe that KPI. It is interesting if we imagine building something related to short supply chains for food products, but we are not so sure about the possibility of doing this kind of activity. Although, one of the scenarios we are imagining is related to the possibility of introducing new products to the municipal markets. Based on our research, it is very clear that these kinds of products are not available now and the supply chains are very long. So it is one of our points of interest, and we could use this KPI but only if one of the scenarios that we are imagining will happen in a reasonable time.*

Project manager: *But isn't it easier to monitor the number of farmers, local farmers from peri-urban areas, because it's easier to detect the number of suppliers rather than number of customers?*

Municipality employee 2: *Yes, it would be easier… but it's the same: this could only be measured if this scenario happens, because at the moment it's just one possible line of work for us.*

Fab Lab member 2: *Just a comment here – we can suggest solutions that imply that the owners or sellers should change their supply chain, but our suggestion might not be effective. We have more leverage on other things, rather than on the products they choose… it was a gut feeling during our research that the market owners were less open to that. So I like the suggestion to track the partners involved in co-creation workshops more than this KPI.* (Observation transcript, KPI calibration workshop, 02-09-2020)

Given the lack of clear objectives and uncertainty regarding which scenarios will be pursued, the adjustments in performance indicators were closely linked to the co-creation, co-design, and co-production actions identified as the ideal action net. On one hand, the indicators intended to measure the process of creating CE solutions were modified to reflect the three actions identified—for instance, *'Number of stakeholders involved in activities'* became *'Number of stakeholders engaged in co-creation, co-design, and prototyping activities'* (KPI calibration workshop, Observation notes, 17-04-2020). On the other hand, the output indicators were adjusted to reflect the most current focus and activities of the initiative—for instance, '*Citizens' awareness regarding urban nature and ecosystem services'* became '*Citizens' awareness regarding peri-urban*

farming and agri-food local chain' (KPI calibration workshop, Observation notes, 17-04-2020).

One of the Fab Lab members explained that: '*I would say that from the stakeholder engagement, from the plain initial interviews to the deep co-design process, where we sat down with them, and we highlighted all the points where there were problems throughout the value chain… I don't know if you remember our very complicated scheme – that made us understand much better how we could deal with the KPIs. And it was a back and forth in fixing them along the way*.' (Fab Lab member 2, Interview, 23-09-2022).

When the co-design action was locally implemented with the relevant stakeholders, the envisioned impact and understanding of underlying conditions for the food system's transition to CE also changed. The desired impact was later expressed as *'Key players of the urban food systems have access to a new way of operating within the value chain, based on materials and processes tracking as a condition for the transition to CE*' (Project meeting, Observation notes, 6-12-2021).

The requirements for transition to a circular food system in Milan were then largely understood in terms of technological advancements and abilities to track material flows and collect and analyse large portions of data. The prototypes to be developed were based on this vision and included a tracking device for fresh fruits and vegetables delivered and sold in municipal markets, a tracking and communication device for food waste in the wholesale market, and a transaction platform for food waste to be exchanged as a potential resource for alternative uses. Based on the new clarity in the vision of a circular food system and objectives for the project, the performance indicators were accordingly adjusted. As the actions progressed, the indicators were 'calibrated' by the Milan city team four more times. The final set of performance indicators for the Milan city team is presented in Table IV.

Performance indicator	Target
Number of agri-food specific city actors and resources identified	150
Number of agri-food specific city resources identified with partners	30
Number of business models/applications developed	3
Overall stakeholder satisfaction with new technological solutions for better implementation of circular business models and practices	75%
Willingness to pay for regenerated products and materials	75%
Number of citizens reached through events/awareness campaign	250
Circular material use rate	+5% increase
Food waste index	~10% increase in agri-food saved and donated
Circular intervention on specific agri-food flows	~10% increase in agri-food tracked and traced
Number of policy makers involved in adapting policies and strategic plans and participating to workshops/dissemination activities	15

Table IV. Final list of KPIs for the Milan pilot city. Table by authors.

The final set of performance indicators reflected the 'proposal KPIs' and 'co-constructed KPIs', both of which were modified in the process of calibration to better fit the emerging vision of a circular food system in Milan. The calibration of performance indicators was deemed necessary to respond to emerging outcomes of the co-creation, co-design, and co-

production actions. A Milan city team member reflected that, '*if you don't know the solution you are working on, it is impossible to define the KPIs. So if you have a co-creation process in the pipeline to define solutions to work on, it doesn't make sense to define KPIs beforehand*' (University employee 1, Group interview, 08-11-2021). Thus, the action net required to develop CE solutions for the food system in Milan had a vast impact on the construction of performance indicators.

However, the development of performance indicators also impacted the development of CE solutions, which is highlighted in the following statement: *'In a way, the process of creating KPIs forced us to be more precise and identify better the solutions. There was a kind of cooperation between the KPIs and the rest of the path. Because it happens that sometimes you start with the co-creation, then you go deeper with the co-design, but by the end it is not so clear what the solution should do. […] So the KPIs helped us to design the last step of our workflows*' (Municipality employee 2, Interview, 23-09-2022).

We observed that process was often challenged, that is, the usefulness of constructing the indicators while the overall vision of circular solutions in Milan was still unclear was questioned on numerous occasions. The team members expressed their dissatisfaction and pointed out the lack of clarity and relevance of the process at the time when it was underway. However, as seen in the aforementioned quote and information gathered from other team members' reflections, the iterative process of creating performance indicators was in fact closely connected with the local action net, which was recognised by the project team members *post-factum*.

Reflecting on the iterative process and its relation to solution development, one project member said that: *'I think it stays in the name – the* circularity *of it. Everything is connected to one another and it's impossible that one thing wouldn't affect the other one. If something changes at the beginning, then you must adjust it in the middle to get it right at the end. So it continues, from that point of view.'* (Fab Lab member 2, Interview, 23-09-2022). In the case of Milan, the vision of CE and solutions related thereto were developed through co-creative processes, in

which an important role was played by the iterative creation of performance indicators.

Discussion

This study contributes to the literature on accounting for a city (Lapsley *et al.,* 2010; Argento *et al.,* 2020; Parisi and Bekier, 2022) by providing a greater understanding of how cities and city initiatives respond to the pressures of measuring and reporting performance on issues that are vague and ill-defined. Knowing that cities are characterised by 'messy realities' (Stafford *et al.,* 2020), where a variety of actors with conflicting interests and visions coexist (Zapata Campos and Zapata, 2012), this study first elaborated on how city initiatives organise themselves across functional boundaries to develop CE solutions. Understanding the organising of a circular food system initiative in Milan, which was closely related to the development of a common vision and objectives, helped us illuminate the processes of performance indicator construction related thereto. The empirical case confirmed the need for broad, multi-level stakeholder engagement and flexibility and innovation in operationalising CE in cities (Prendeville *et al.,* 2018). Adopting the lens of an action net (Czarniawska, 2004; 2010b) helped us identify the interconnected actions of co-creation, co-design, and co-production, all of which are required for the development of CE solutions at a local level.

The ideal action net (Lindberg and Czarniawska, 2006) in the Milan initiative assumed broad stakeholder mobilisation in the three actions to ensure a collaborative definition of objectives and strategy. This subsequently resulted in the initiative achieving relevant and meaningful outcomes. In fact, the definition of the ideal action net preceded the development of a common vision of CE and specific objectives of the project, which became closely intertwined as the initiative in Milan progressed. The actions embedded in the net were coordinated by the Milan city team (participants to a large European CE project), who, although consisting of the municipality, Fab Lab and university representatives, often spoke in one voice, presenting itself as a macro-actor (Czarniawska, 2010b).

An analysis of how the Milan city team assembled and emerged in the European project as an actor-network is outside the scope of this study. It would be much more suited for an in-depth study adopting an ANT lens (Czarniawska, 2010b). Instead, we focused on the co-constitutive processes of organising, visioning, and constructing performance indicators, for which the lens of an action net was deemed more appropriate.

The three actions identified: co-creation, co-design, and co-production, were translated into one another with the help of various actants and mediators operating at the connecting points (Czarniawska, 2004; 2010b; Latour, 2005). Non-human actants played particularly important roles, influencing how the actions developed (Latour, 2005). For instance, the online whiteboard tool 'Miro' allowed for a specific type of visualisation of value flows, which determined how solutions were designed; the Grant Agreement provided boundaries for action and translated various interests of the project members into local action in Milan. Furthermore, the study demonstrated that the ideal action net did not unfold in isolation, but was instead influenced by various connected actions. In the case of Milan, the development of performance indicators and related activities (organised in the three phases of *longlisting*, *shortlisting,* and *calibrating*) constituted an action that was closely knotted with a larger action net of developing CE solutions at the local level.

Within the traditional management accounting literature, performance management and measurement systems have key operational and incentive purposes (Speklé and Verbeeten, 2014); they are part of the management control systems designed to ensure accountability among organisational actors in reaching certain performance targets (Merchant and Otley, 2006). There seems to exist a general agreement that '*good measures must reflect progress toward achievement of the organisation's objectives'* (Merchant and Otley, 2006, p. 792).

In the public sector, particularly after the NPM reforms (Hood, 1995), performance was predominantly understood as a contract guiding civil servants' efforts towards the pre-defined objectives (Bevan and Hood,

2006). However, to serve its incentive- and control-oriented functions, performance measurement requires conditions of high contractibility (Speklé and Verbeeten, 2014). These conditions include the following: (1) organisational goals need to be unambiguous and specified in advance, (2) organisations should be able to identify or construct performance indicators that are aligned with the pre-defined objectives, and (3) the actors within the organisation should know and control the production function that translates efforts into results. However, as demonstrated in the case of Milan, in some situations where goals are ill-defined and objectives are debated; where multiple actors have to collaborate in a dispersed setting; and where specialised technical knowledge is required to understand and predict how efforts translate into results, the definition of what constitutes a 'good' performance and how relevant indicators should be selected or developed, becomes challenging. Thus, in this study, performance indicators were constructed in a long, iterative, collaborative process, influenced by the ongoing organising of solution development and related definition of the vision and objectives. Within this process, various actants—both human and non-human—played key roles, modifying and distorting the performance indicators (Latour, 2005).

For instance, the organisations selecting the sources for the longlist and coordinating the process had a vast influence on the final form of the indicators in Milan. They helped establish the boundaries of the longlist and the process, consistent with their own interests. Similarly, the sources from which the longlist was selected had a powerful influence in shaping the indicators by providing a plethora of possible directions for the project when local objectives were still under development.

In a situation where goals and objectives for a 'circular city' were under development simultaneously with the performance indicators, it became instrumental for these processes to connect and be translated into each other. This ultimately impacted the construction of the final set of performance indicators. The close knotting (Czarniawska, 2004; Lindberg and Czarniawska, 2006) of performance indicator construction with the

broader action net reflected the co-constitutive nature of the two processes. As illustrated using the case of Milan, the outcomes of each step in the action net influence the construction of performance indicators, while the construction of performance indicators impacts the way solutions are ideated and operationalised.

Given the co-constitutive nature of solution development, visioning, and performance indicator development, it also became apparent that how performance is measured for a 'circular city' initiative in Milan is neither based on predefined organisational objectives and goals, nor on an understanding of the production function (Speklé and Verbeeten, 2014). Instead, 'good' performance came to be understood based on translations of various actions into the final set of performance indicators. This could have broader implications for the role of performance measurement in cities and circular transition projects because the possibility for benchmarking and using performance indicators as means of control diminishes in such settings. While some studies have pointed towards issues with top-down implementation of performance indicators based on global frameworks (Sobkowiak *et al.,* 2020), this study demonstrates that the reverse situation may also become problematic if performance indicators are used for operational or control purposes.

The literature on performance measurement in the public sector has examined situations in which performance indicators were not reflective of organisational goals largely through institutional theory and concepts of decoupling or loose coupling (cf. Modell, 2009). However, these studies have primarily focused on the roles of performance measurement in such situations, pointing towards their symbolic or ritualistic use (Agostino and Arnaboldi, 2017; Dobija *et al.,* 2019). This study draws on concepts from organisation studies and sociology of translation in order to closely examine the dynamics of the construction of specific performance indicators in the city context. Accordingly, it contributes to the body of research on accounting for the city and public sector performance management by

enhancing the understanding of how performance measurement is fabricated before it becomes a 'black box' (Latour, 1987).

Conclusion

The concept of circular economy is being increasingly adopted by cities as a strategy to improve sustainability performance (Prendeville *et al.* 2018) and competitiveness (Kornberger and Carter, 2010). Its monitoring and reporting are encouraged by a host of governmental organisations and regulatory bodies (see COM, 2020; OECD, 2020). However, given the ambiguity of the concept (Kircherr *et al.*, 2017) and 'messy realities' of a city (Stafford *et al.*, 2020), cities face challenges in defining the specific performance indicators for CE initiatives. This study argues that 'circular city' initiatives present an extreme case of low contractibility (Speklé and Verbeeten, 2014), where goals and objectives are ill-defined, and actors are unable to predict the likely outcomes of various alternative courses of action. Therefore, this study contributes to the accounting literature focusing on cities (Lapsley *et al.,* 2010; Argento *et al.,* 2020) by enriching the extant understanding of how city initiatives construct performance indicators in situations of low contractibility.

This study adopts the perspective of an action net (Czarniawska, 2004; 2010b) and mobilises concepts from sociology of translation (Latour, 2005) to illuminate how the development of CE vision and specific solutions is organised in the city and how the performance indicators are constructed in relation thereto. By adopting this theoretical lens, we study the co-constitutive relationship between the two processes, uncovering the connecting points through which they are knotted together (Lindberg and Czarniawska, 2006).

This empirical study on a CE initiative in Milan has provided three main conclusions. First, the findings confirm that the operationalisation of CE within cities requires broad, multi-level stakeholder engagement and openness towards innovation and flexibility in solution development (Prendeville *et al.,* 2018). As CE remains an ambiguous and vague concept

(Kircherr *et al.,* 2017; Korhonen *et al.*, 2018), its objectives are challenging to define on a local scale and the production function is not fully understood, which results in a case of low contractibility (Speklé and Verbeeten, 2014).

Second, the findings demonstrate that in cases of low contractibility, which circular city initiatives are an extreme case of, the development of CE solutions requires interconnected actions that span across organisational boundaries. In the investigated case, the three key actions of co-creation, co-design, and co-production, were identified to constitute an ideal action net (Lindberg and Czarniawska, 2006) for development of CE solutions in the city of Milan. Moreover, these three actions were closely connected and translated into one another with help from human and non-human actants and mediators (Latour, 2005).

Lastly, the findings reveal that as the action net unfolds, it becomes closely knotted with the development of performance indicators. This circumstance impacts the development of the CE vision and related solutions. Thus, in the absence of a clear vision and established objectives, the processes of their development and performance indicator development are co-constitutive of each other.

Given the co-constitutive nature of CE solution development, vision, and performance indicator development, the findings indicate that the performance of the CE initiative in Milan came to be understood based on the translations of various actions into a single set of performance indicators. As governmental organisations and regulatory bodies are increasingly encouraging cities and regions to monitor and report their CE performance (see COM, 2020; OECD, 2020), not least for control and benchmarking purposes, these findings challenge such ambitions. While extant research has demonstrated that top-down implementation of performance indicators may not bring the desired forms of calculability on local levels (Sobkowiak *et al.*, 2020), this study demonstrates that the bottom-up approaches to performance indicator development may not

serve the purpose desired by the governmental and international organisations.

However, this study allows us to speculate that performance management for 'circular city' initiatives does not serve as means of control, but could take on more symbolic, ritualistic roles (see Agostino and Arnaboldi, 2017; Dobija *et al.,* 2019) or be put to exploratory use (Speklé and Verbeeten, 2014).

Accordingly, the results suggest avenues for further research into roles of performance measurement practice in 'circular cities', especially those created based on self-organised, bottom-up approaches (cf. Sobkowiak *et al.* 2020). It is important to understand that such construction of performance indicators can be *'a means of conversation, rather than a means of control, and an expression of values, rather than an instrument for action'* (Czarniawska-Joerges and Jacobsson, 1989 in: Dobija et al. 2019). As more cities turn to more sustainable approaches for city management and operations, not least within CE, further research could explore how and to what ends various technologies of management and control can be used in such settings.

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Concluding discussion

As a starting point, this thesis rests on a premise that implementation of circular economy in cities requires cross-sector collaboration (Ghisellini *et al.*, 2016; Prendeville *et al.*, 2018), where initiatives involving diverse stakeholders develop, test, and scale circular economy solutions. Such collaborative initiatives are inherently complex and characterised by a multitude of conflicting values, visions of urban development, and understandings of circular economy (Grossi and Argento, 2022; Grossi and Trunova, 2021). Their success requires not only effective management (Bourmistrov and Mouritsen, 2022), but also systems that encourage public participation, facilitate information flows, and foster dialogue and debate (Almqvist *et al.,* 2013). Performance measurement has been recognised as one of such systems that can serve as a space for negotiation and reconciliation of different values (Grossi and Argento, 2022).

In such settings, the understanding of what performance means to different actors and how it is accounted for remains unclear, as accounting has been typically practiced and researched with focus on a specific entity rather than on collaborations or relationships (Killian and O'Regan, 2020). In recent years, both public sector accounting and circular economy accounting literature begun to call for more research into how performance can be accounted for given the collaboration required and the ambiguity of the common goals (Grossi *et al.,* 2023; Grossi and Argento, 2022; Wishart and Antheaume, 2021). Therefore, the starting point and initial ambition of this PhD thesis were to investigate how circular economy performance is accounted for in city initiatives, which presuppose involvement of diverse actors. This thesis examined these issues by studying performance measurement 'in action' (Hopwood, 1983; Baxter and Chua, 2009), following an EU-wide project focused on development and implementation of circular economy solutions in six European cities. The empirical investigation contributed to a more nuanced understanding of current

practices but also led to theorise how performance *can be* accounted for in similar settings. Following the practices of performance accounting illuminated how the characteristics of circular economy and collaboration influence these practices, while adopting an ANT approach contributed to understanding how different voices in a collaborative initiative are translated into performance accounts.

This section begins by discussing the overall research question and its contribution to understanding performance accounting in practice and how circular economy performance can be accounted for in collaborative initiatives. Throughout the three articles, the thesis engaged in two key debates: on one hand, it engaged with public sector accounting research on collaborative governance, exploring how performance is accounted for in collaborative initiatives in cities; on the other hand, it joined the emerging field of research on circular economy accounting, exploring how circular economy performance is accounted for in practice. Each of these debates is enriched with theoretical contributions on what implications collaboration and circular economy respectively may have for performance accounting – these contributions are discussed in the following sections. The section goes on to discuss the contributions of mobilising ANT to study performance accounting in collaborative initiatives in cities and concludes with a reflection on the study's limitations and recommendations for future research.

Performance accounting for circular economy in collaborative initiatives in cities

Public sector accounting research has recognised that accounting for performance in collaborative initiatives is a challenging endeavour (Grossi and Argento, 2022; Killian and O'Regan, 2020; Almqvist *et al.,* 2013). Several factors hindering the implementation and practice of performance measurement in this context have been identified, including diverging interests, values, and objectives of collaborating actors (Zawawi and Hoque, 2022), complexity and increased number of forms of accountability (Grossi

and Argento, 2022; Almqvist *et al.,* 2013) and difficulties in managing cooperation, coordination, and legitimacy (Argento *et al.*, 2020). Typically, the studies in public sector accounting focus on performance measurement and management and follow the assumption that performance information is quantifiable (Arnaboldi *et al.,* 2015; Arnaboldi and Azzone, 2010). The 'performance management technologies' that are frequently investigated in literature include budgetary control, KPIs and benchmarking, Balanced Scorecard, Lean Management (costs control), and managerial checklists (see Arnaboldi *et al.* 2015). This focus is likely driven both by empirical observations, as public sector had indeed adopted many tools and approaches from private sector in the wake of NPM (Hood, 1995), but also by NPM being the dominant theoretical lens to study public sector accounting (Steccolini, 2019).

Based on the empirical observations of collaborative initiatives in cities, this study argues for a broader perspective on performance *accounting*. The performance management technologies adopted from private sector indeed play an important role in management control and benchmarking (Speklé & Verbeeten, 2014; Hood, 1995), also in city management (Klopp and Petretta, 2017). They serve their purpose best in individual organisations, as their implementation in hybrid- or networked arrangements have been deemed problematic (Zawawi and Hoque, 2022; Grossi et al., 2017); single organisations are also the predominant context, in which they have been studied (Killian and O'Regan, 2020). However, their usefulness for improving performance is limited when it comes to implementation in collaborative initiatives (Hoque and Adams, 2011). In cases where objectives are unknown and ambiguous, responsibilities are spread across organisational boundaries, and actors are expected to engage in collaboration, performance accounting might take different roles: not least in driving dialogue and debate (Almqvist *et al.*, 2013), negotiating and reconciling conflicting values (Grossi and Argento, 2022), or in more symbolic and ritualistic use (Dobija *et al.*, 2019). In such context, it is also

expected to take different forms (Czarniawska, 2010), which, as this thesis argues, may not necessarily be strictly quantitative.

Article 1 in this thesis highlighted the multiple and diverse narratives of circular economy performance that exist in a collaborative initiative, indicating that containing these narratives in a single performance measurement framework would not only be challenging, but would also conceal aspects of performance that do not easily lend themselves to quantification. Participants in the circular economy initiative, that is members of municipality (public sector), advisory firm (private sector), research and innovation lab (NGO), and innovation centre (NGO), all brought forward different narratives of performance, which reflected different dimensions of sustainability (Elkington, 1997). Amongst these narratives, particularly those related to achieving behavioural change among citizens, encouraging businesses to rethink their activities, and connecting relevant stakeholders in new networks, were not easily translated into numbers. Instead, they were translated into visual inscriptions (Latour, 1987; 2005), so they could be easily mobilised and act 'at a distance' (Latour, 1987). Meanwhile, environmental performance, which first gained significance due to the MFA conducted in the project, was translated into additional KPIs. This consequently granted it more visibility and significance in the project, as the prevalent logic in performance assessment is still privileging quantitative accounts. However, as this article argued, the primacy of quantification challenges principles of dialogic accounting, which argue for increased diversity and variety of accounts, and avoiding reductionism (Brown, 2009).

Similarly, **Article 2** highlighted that any performance accounting device is inherently reductionist and unable to capture all characteristics of circular economy. In attempts to create a single device that would comprehensively account for and monitor circular economy (Wishart and Antheaume, 2021; Elia *et al.,* 2017; Cagno *et al.,* 2022), various devices have proliferated both in academic and practitioner sources (Gasparatos *et al.,* 2009). However, as this study suggested, the devices that are imposed on the initiative become

contested and subsequently adapted (tinkered with; Knorr, 1979) and blended together (bricolaged; Lévi-Strauss, 1966). For instance, the Theory of Change was 'implemented' in the project based on a specific template (Nesta, 2019); however, as the project progressed, the template evolved. Different categories ('scenarios', 'long-term' and 'short-term' outcomes), colour codes, and a timeline were added. Once the Theory of Change was visualised and made accessible in an online whiteboard, it also served as a space for interaction of different devices. Information from MFA, value flow mapping, SROI, and KPIs were blended into the Theory of Change in a 'patchwork', ad-hoc manner. In a context where new information was emerging and circumstances were changing (e.g. due to the COVID pandemic), the flexibility offered by tinkering with and bricolaging performance accounting devices was appreciated. It provided space for dialogue and representation of initiative's performance that was important to different actors.

Although **Article 3** focused more specifically on KPIs, which can be considered one of the more "traditional" performance management technologies (Arnaboldi *et al.,* 2015), it highlighted issues with their top-down implementation, pointing out the challenges in capturing the idea of performance in collaborative initiatives. As solution development, defining the vision, and development of performance indicators are connected in such settings and are co-constitutive of each other, what "good" performance means came to be understood based on translations of various actions into the new set of performance indicators.

Overall, this thesis confirmed that performance accounting remains an important task in collaborative initiatives to enhance communication between stakeholders, foster debate, and account for progress towards circular economy (Wishart and Antheaume, 2021). In so doing, it highlighted that performance accounting has an opportunity to increase representation and stakeholder inclusion in the creation of accounts. As such, it has a chance to fully embrace the practices of dialogic accounting (Brown, 2009; Brown and Dillard, 2015a, 2015b) and escape the conception

of entity-based accounting that privileges the needs of a narrow group (Killian and O'Regan, 2020). As the results of this study suggest, such approach requires embracing the new roles that performance accounting plays in collaborative initiatives, and consequently allowing for the accounts to be co-created in a flexible, iterative, bottom-up way.

Implications for public sector performance accounting

Public sector accounting research has recognised that, as the sector increasingly adopts collaborative governance approaches (Grossi and Argento, 2022), 'public sector' accounting should go beyond (1) accounting for a single organisation (Steccolini, 2019; Almqvist *et al.,* 2013), (2) command and control use (Almqvist *et al.,* 2013), and (3) accounting in line with a single dominant set of values (van Dooren *et al.,* 2015). As accountability thus shifts to be more open and inclusive, as in social and dialogic accountability (Grossi and Argento, 2022; Brown, 2009), this thesis proposes that collaborative initiatives serve as a context where dialogic accounting (Brown, 2009) can be explored and practiced.

Typically, performance accounting devices are imposed on organisations, projects, and initiatives (Abhayawansa *et al.,* 2021); even the SDGs that are often hailed as the outcome of the largest consultation in human history (United Nations, 2023) can be understood as a top-down mechanism when applied on different entities (Sobkowiak *et al.,* 2020). Meanwhile, as this thesis suggests, imposing performance accounting devices and approaches fails to capture the multitude of perspectives and result in forms of calculability that would be useful in a given context. This challenge is further exacerbated in situations where a single, integrated framework is suggested to monitor all characteristics deemed important to be monitored – which is an approach pursued not only in public sector accounting (Brignall and Modell, 2000) but also in accounting for circular economy (Wishart and Antheaume, 2021; Cagno *et al.,* 2023). In such situations, even if portrayed as a 'neutral' framework reporting only 'the facts' (Solomons, 1991), accounting ends up privileging a specific perspective, most frequently

rooted in neoliberal views centred on the needs of finance capital (Killian and O'Regan, 2020; Brown, 2009).

In contrast, dialogic accounting (Brown, 2009; Brown and Dillard, 2015a, 2015b) recognises heterogeneity and allows for a pluralist expression of public interest, potentially even of a common good (Killian and O'Regan, 2020). It assumes involvement of multiple stakeholders in developing innovative accounting tools and methods that gather and report information relevant to their diverse interests (Manetti *et al.,* 2021) and understandings of sustainability (Bebbington *et al.,* 2007; Brown and Dillard, 2015b). Consequently, dialogic accounts have been discussed as particularly helpful in facilitating collaborative endeavours (Brown and Dillard, 2015b). Different approaches to dialogic accounting have been suggested in theory, for instance scenarios workshops or multicriteria analysis among others (Brown and Dillard, 2014), however, empirical examples on how performance accounting can move from the conventional monologic to more dialogic approaches are scarce.

This thesis, via Article 1, suggests that collaborative initiatives serve as an arena where multiple and varied narratives of performance coexist. In such context, the idea of universal narrative is unlikely to materialise, and thus any accounting that serves interests of a single narrative would be reductionist. Dialogic accounting, which rejects the idea of a universal narrative and views society as *"contests of narratives"* (Brown, 2009, p. 317), is therefore likely to emerge in contexts of collaborative initiatives. Indeed, the practices observed, where accounting devices suggested by the project were bricolaged and tinkered with (Article 2) and where KPIs were co-created (Article 3), contributed to granting visibility to multiple perspectives.

It is important to note that translating various ideas of circular economy performance into different indicators and performance accounts was not a quick, one-off exercise. The co-creation of KPIs in the city initiatives in the project took 24 months, while the modifications to Theory of Change and the blending together of different devices were an ongoing process during

the three-year project. However, providing the time and possibility for city initiatives to modify accounting devices gave accounting the opportunity to foster dialogue and debate. Devices such as KPIs, Theory of Change, or MFA, were brought into project management meetings, pilot city team meetings, and more informal conversations. The workshops, where Theory of Change and KPIs were developed, were used as a space to negotiate diverging views on circular economy performance. By analysing these practices, this thesis highlighted how accounting can serve as *"a vehicle with the potential to foster democratic interaction rather than a set of techniques to maximise shareholder wealth and construct 'governable' others"* (Brown, 2009, p. 317).

In so doing, this thesis also illustrated that both 'traditional' accounting devices (e.g. KPIs) and those less conventional (e.g. ToC visualisations) have a potential to create dialogic accounts. For instance, Article 2 highlighted that the dialogic potential can be realised by avoiding reliance on a single accounting device and allowing for a variety and flexibility of accounting forms. Meanwhile, the findings of Article 1 pointed out that although different narratives of performance exist, it is often those easily quantified that enrol supporters and achieve significance in a collaborative initiative. Indeed, previous studies found that there is a tendency in e.g. city rankings to rely on known calculative elements and logics, which in turn limits the dialogic potential of accounting (Aleksandrov *et al.,* 2022). However, Article 3 illustrated that even the KPIs, which are associated with the calculative logic, can emerge from the need to translate specific actions into performance account in a way that is linked with co-creation, giving visibility to different voices and approaches to development of circular economy solutions in the city. Collectively, the articles in this thesis do not argue for a primacy of a specific approach in creating dialogic accounts, but rather illustrate that allowing flexibility in collectively iterating accounting devices, each of them can support more dialogic forms of accounting.

Overall, this thesis advocates that the growing literature on accounting for a city and dialogic accounting literature deserve more bridges between them. Given the complexity of city ecosystems (Williams, 2019; Grossi and

Trunova, 2021; Brorström *et al.,* 2018) and possible obsolescence of traditional accounting mechanisms in city management context (Czarniawska, 2010), new, dialogic forms of performance accounting are likely to emerge in city initiatives.

Implications for circular economy accounting

Circular economy has been experiencing increased attention in accounting studies; however, the literature explicitly focused on circular economy and published in accounting journals is still scarce (Arjaliès *et al.,* 2023; Wishart and Antheaume, 2021; Larrinaga and Garcia-Torea, 2022). Given that circular economy and sustainability are considered to be closely interrelated concepts (Kirchherr et al., 2023), with numerous characteristics in common (both are characterised by ambiguity and lack of clear definition and require collaborative efforts to be addressed in practice), this thesis argues that taking circular economy initiatives as case studies can contribute to understanding sustainability accounting – and vice versa.

Although the most common definition of sustainability quotes the Brundtland Report (UNWCED, 1987), understanding of what sustainability means in practice has been more problematic (Bebbington and Gray, 2001; Gray, 2010). It has been found to be a complex concept, with multiple dimensions (Thomson, 2014). Similarly, Article 1 of this thesis disentangled different circular economy performance narratives, highlighting the multidimensionality of circular economy as a concept, and thus confirming the similarity of the two concepts on this characteristic. Academics and practitioners try to provide a single framework that could capture and monitor each of the concepts (Wishart and Antheaume, 2021; Adams and Abhayawansa, 2022). This thesis finds, via Article 1 and Article 2, that a single device is often unable to capture the complexity of circular economy. The findings in Article 1 illuminated that to capture the multidimensionality of circular economy, quantification is often insufficient – even if it is at times the 'default' mode of performance accounting. In the city initiative of Amsterdam, circular economy performance was translated into written

narrative accounts, visualizations, graphs, and diagrams, as performance indicators expressed in quantified terms were not able to capture 'the whole story'. At the same time, as discussed in Article 2, imposing a performance accounting device can lead to more patchworked and improvised accounting where actors mobilise information available "at hand" (Molecke and Pinske, 2017). This has two important implications.

First, as discussed in Article 2, the patchworked manner in which performance was accounted for in the city initiatives confirms that multidimensional concepts, such as sustainability or circular economy, require more than a single methodology to account for their performance (Gasparatos *et al.,* 2009). However, these findings suggest that the use of multiple devices is not necessarily a conscious and deliberate practice, but rather emerges ad-hoc and based on translation of different ideas of performance into inscriptions that give them significance.

This points to the second implication, which relates to the performativity of devices and its relation to the bottom-up mobilisation of actors to modify them and create own performance accounts. Accounting studies have for long recognised that accounting devices are not disinterested technologies, but rather active participants (Latour, 2005) in e.g. performance measurement (Busco and Quattrone, 2015) and calculation (Muniesa *et al.,* 2007) as they enact specific discourses. Their physical-visual form, such as selection of categories and their visual arrangement, has also been found to have a performative effect on accounting (Ruff, 2021). Based on this premise, implementation of any performance accounting device in a given initiative will result in a specific form of calculability and, consequently, in similar biases and omissions in the final accounts. With evidence from collaborative initiatives, the articles in this thesis confirm that indeed many performance accounts would be lost in a rigorous implementation of performance accounting devices – particularly if only one of them is selected (Cagno *et al.,* 2023; Wishart and Antheaume, 2021). All articles in this thesis highlight how the actors in collaborative initiatives contested imposed performance accounting devices, at the end providing accounts

that translated multiple ideas of circular economy performance. While faithful adherence to specific accounting devices is often considered a hallmark of "good" or "rigorous" accounting (Ruff, 2021), this thesis invites to challenge the view on what "good" performance accounting is. Allowing modifications and mobilizing various devices to account for circular economy performance in a collaborative initiative could in fact result in more nuanced, inclusive reports. Rather than focusing on creating the "ultimate" performance measurement device (Cagno *et al.,* 2023; Wishart and Antheaume, 2021), more attention should therefore be given to using the existing devices well, that is with flexibility and space for adaptation.

Methodological contribution: focus on actors, actions, and narratives

Accounting research most often takes a single organisation, firm, or team as a 'case' to study where accounting is practiced. After all, accounting has been understood as a primarily individual activity, focused on a single entity (Killian and O'Regan, 2020). Meanwhile, by adopting a methodology based on ANT to study a collaborative initiative, this thesis illustrates that accounting practices can be studied beyond actors' organisational boundaries. As ANT focuses on the traces and associations between actors (Latour, 2005), it allows to explore connections in collaborative settings that could otherwise go unnoticed. The three articles provided various examples where performance accounts were tied to different actions (Article 3), narratives (Article 1), or devices (Article 2). Additionally, mobilising ANT as a method theory (Lukka and Vinnari, 2014) provided an opportunity to observe the practices of dialogic accounting (Brown, 2009; Brown and Dillard, 2015a, 2015b), helping to illuminate how different voices were translated and how they gained significance in the initiatives. While exploring dialogic accounting with a constructivist lens rooted in Science and Technology Studies has been suggested (Brown and Dillard, 2015a), this thesis demonstrated how engagement with ANT specifically can help

to better understand the participatory practices that lead to co-development of performance accounts.

Dialogic accounting has been proposed as a way to 'open up' traditional accounting beyond the shareholder-centric view (Brown, 2009; Brown and Dillard, 2015a). At its core, it assumes various stakeholders to have diverse values, interests, expectations, as well as ties to and affiliations with other stakeholders. As such, dialogic accounting avoids assigning specific stakeholder categories (e.g. employees, customers, investors) or identities a priori (Brown and Dillard, 2015a). With its flat ontology, recognition of human and non-human actors, and strong focus on associations (Latour, 1987, 2005), ANT thus lends itself as a relevant lens to observe dialogic accounting in practice. As demonstrated in the articles of this thesis, ANT provides a conceptual toolbox to follow diverse values and interests present in a collaborative initiative and to study performance accounting as a social, emergent practice. While accounting research has begun to explore dialogic accounting practices in cities (Grossi *et al.*, 2021), and cities have been studied with the lens of ANT (Pipan and Czarniawska, 2010), this thesis suggests that further exploration of collaborative initiatives in cities, where dialogic accounting practices can be particularly visible, can be aided with drawing on an ANT conceptual toolbox.

Additionally, this thesis contributes to public sector accounting and circular economy accounting studies by demonstrating how different combinations of ANT and theoretical concepts from other theories can enhance the understanding of performance accounting even further. For instance, Article 1 adopted a theoretical framework based on ANT and the concept of antenarratives (Boje, 2001). In collaborative settings where diverse voices coexist among a broad range of actors (Grossi and Argento, 2022), studying antenarratives (Boje, 2001) with particular focus on how they emerged and travelled across the initiative provided a more nuanced understanding of performance. Engaging with the concept of antenarratives allowed to draw a distinction between the multiple, fragmented narratives emerging 'bottom-up' and the narrative imposed on the initiative by the project

management. Combining the antenarrative approach with concepts of 'translation' and 'mediators' from ANT further allowed to explore how the emerging narratives move and interact in the initiative with the help of specific actants and inscriptions. Article 3 provided another example, where ANT was combined with the concept of action-nets originating from organisation theory (Czarniawska, 2002, 2010). This combination allowed to study the translations of actions into specific performance indicators, but also translations of performance indicators that shape the actions in a complex action net they are embedded in. As such, it allowed to observe the co-constitutive nature of developing a vision of circular city in a participative, collaborative manner and constructing performance indicators.

Limitations

This thesis has two key limitations that deserve attention: reliance on data from a single EU project and potential bias stemming from my involvement in the field.

As explained in the case description and methodology sections, this thesis relied on data collected from a single EU project. The project involved six different cities, each focused on developing circular economy solutions for different material flows, thus increasing the potential diversity of stakeholders and practices in the different city initiatives observed. However, as all city initiatives were bound by the same project contract and, at least within the project, interacted with similar stakeholders, the practices of performance accounting in the six cities bore close similarities. Meanwhile, as different project or city initiatives beyond REFLOW are likely to have different governance structures and accountabilities, performance accounting in these initiatives may also be different. This can be recognised as a limitation that influences transferability (Lincoln and Guba, 1985) of findings – however, transferability is far from the only criterion of quality in qualitative research (Steccolini, 2023). In this research, rather than achieving transferability of findings, I chose to strive for

convincingness (Golden Biddle and Locke, 1993), where authenticity, plausibility, and criticality are the key quality criteria. To that end, I focused on providing rich descriptions and examples from the field to communicate its complexity in a genuine way; by applying relevant theoretical concepts in the analysis I aimed to achieve plausibility so that the text *"makes sense"* to the reader (Golden Biddle and Locke, 1993, p. 600); lastly, with the studies on co-created performance accounts I hoped to activate the readers to challenge the existing assumptions about performance accounting.

Second limitation can stem from my personal involvement in the project. As described in the methodology section, I was one of the project members in REFLOW. Proximity to the field is not problematic in itself; in fact it is often expected of qualitative field researchers to develop engage closely with the studied field (Ahrens and Chapman, 2006). However, given the chosen theoretical framework of ANT it was important for me to observe the actors and not interfere in the emergence of associations between them. To achieve this, I tried to remain close enough to achieve "interactional expertise" (Langley *et al.,* 2013) – get to know the actors and their lingo to be able to communicate about the domain and understand what is going on – but at the same time focus on reflexivity in managing these interactions (Langley *et al.,* 2013). Additionally, collaborating with my supervisor on data collection and analysis, and triangulating the data were important techniques to ensure analytical rigour. Moreover, the possibility of recording most meetings and interviews allowed me to 'leave' the data and revisit them at a later point, thus providing some distance from the situations and an opportunity to move back and forth between data and theory (Van Maanen *et al.,* 2007).

Future research

As this study explored a broad topic of performance accounting in collaborative initiatives, it opened up several avenues that future research on this topic could pursue. These include but are not limited to: further in-depth exploration of performance accounting practices in relation to

different roles or expectations of accounting, an analysis of performance as a contested concept, and comparative research of accounting in collaborative initiatives with various governance and accountability structures.

First, as this thesis was interested in how circular economy performance is accounted for in collaborative initiatives in cities, it assumed specific roles that accounting may take in such context – that is of fostering dialogue, sharing information, and allowing for reconciling different ideas of performance between collaborating actors (Grossi *et al.,* 2023; Grossi and Argento, 2022; Almqvist *et al.,* 2013). Meanwhile, the most commonly cited roles of performance accounting are those of control, benchmarking, and supporting decision-making (Speklé and Verbeeten, 2014, Klopp and Petretta, 2017; Bourmistrov and Mouritsen, 2022). To that end, the dialogic potential of accounting that more explicitly serves the "command and control" roles (Almqvist *et al.*, 2013) deserves further investigation.

Second, more attention should be given to the meaning of performance in different contexts. Critical dialogic accounting and accountability research have been studying key concepts, such as accountability, equality, and social justice, as contested concepts (Grossi *et al.,* 2023). As 'performance' has been a taken-for-granted concept, which substance has not been questioned or fully explored (Van Dooren *et al.,* 2015), future research could approach it as a conception of concept (Dobson, 2011) and contest it. While Article 1 in this thesis provides an insight into different visible narratives of performance in a collaborative initiative, further research could focus on the meaning of performance in different groups and in different discourses. I here agree with Judy Brown (Grossi *et al.,* 2023) that studies exploring how actors draw on different discourses to reinforce and/or contest particular understandings of performance would be a relevant addition to the literature on public sector accounting.

Lastly, as this thesis drew its conclusions from a study of a single EU project, future research could take more comparative approaches. As various public sector contexts, including collaborative initiatives, operate

with various and often complex governance and accountability structures (Zawawi and Hoque, 2022; Almqvist *et al.*, 2013), a comparison of performance accounting practices in relation to these structures would be a timely pursuit.

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Appendix 1

Assessing and managing the impact of COVID-19: a study of six European cities participating in a circular economy project

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Abstract:

Purpose: This paper aims to explore the role of performance measurement systems as technologies of government for the assessment and management of the effects of COVID-19 in the context of six cities involved in a large European project.

Design/methodology/approach: Based on the field study of a large European project, this paper relies on a comparative case study research approach (Yin, 2003). This research design allows insights into the role of central and local key performance indicators (KPIs) in managing the ongoing pandemic.

Findings: This paper explores the role of accounting in the assessment of the COVID-19 pandemic. Its findings illustrate how the "adjudicating" and "territorialising" roles (Miller and Power, 2013) of local and central accounting technologies rendered the COVID-19 pandemic calculable.

Originality/value: This paper connects central and local performance management systems in the context of the COVID-19 pandemic. It relies on a governmentality approach to discuss how different programmes and the relative KPIs were impacted by the ongoing global crisis.

Keywords: COVID-19, performance measurement, governmentality, circular economy, cities, European Union

Paper type: Research paper

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Introduction

Cities play a fundamental role in the transition from a linear to a circular economy, as they are complex networks of private and public actors in charge of specific policies influencing citizens' well-being, the environment and the economy of the territory (OECD, 2020). Circular economy has been subject to numerous definitions and conceptualisations over the last decade (Murray *et al.,* 2017) as it has been considered the latest attempt to implement sustainable practices in line with the Brundtland Commission's Report (WCED, 1987). Despite the circular economy growing as a business construct within urban systems (Ellen MacArthur Foundation, 2019), there is yet little formal academic debate within the sustainability accounting literature on the role of cities in the transition to circular economy and its measurement in social, environmental and economic terms (Czarniawska, 2010). The outbreak of the novel COVID-19 pandemic at the turn of 2020 (World Health Organization, 2020) with its unanticipated and dire consequences for the global community, exacerbated the complexity faced by cities in their transition towards circular economy due to the "behavioural responses to the virus itself [...] and [the] government interventions aimed at locking down much of the economy" (Foss, 2020, p. 1323).

Accounting as a technology of governing has been studied in numerous public and private contexts (Mennicken and Miller, 2012). Moreover, the role of accounting has been explored to unpack the elements of rationalisation and operationalisation in the case of natural, localised disasters (Lai *et al.,* 2014; Sargiacomo, 2015). For example, studies have shown how accounting created a sense of interdependency between the actors involved in flood recovery (Lai *et al.,* 2014) and the role of accounting in making "exceptional" governance possible in the case of an earthquake (Sargiacomo, 2015; Sargiacomo and Walker, 2021).

Existing studies on the role of accounting within crises have mostly focussed on their aftermath (Lai *et al.,* 2014; Sargiacomo, 2015; Sargiacomo and Walker, 2021). In fact, only a limited number of studies have focussed

on the role of accounting in assessing and managing the impact of the ongoing COVID-19 pandemic. Thus far, researchers have focussed on how accounting can play a role in defining the value of life when representing the number of fatalities due to COVID-19 (Yu, 2021). Moreover, Parker (2020) studied the impact of COVID19 in the government and community occupational health through analysing cost control agendas within offices. However, researchers have devoted limited attention to the role of performance measurement systems in this setting.

Based on the fieldwork performed within six European cities involved in a large European project currently under way, this paper explores the role of performance management systems as technologies of governing to evaluate and manage the effects of the COVID-19 pandemic.

The European project, which is the object of this study, aims at creating a model for cities' transition towards circular economy and implementing it in six European cities of different sizes, including capital cities and small towns. In the context of the project, each of the six pilot cities is characterised by a complex network both at a local and project level. The contract stipulated by the project participants with the European Commission, called Grant Agreement, is based on specific tasks and reports that the participants must prepare according to a predefined calendar. Moreover, specific "central" key performance indicators (KPIs) have been included in the contract between the partners and the European Commission to assess the success of the circular transition of the six pilot cities at the end of the project. Finally, pilot city consortia agreed to develop specific "local" KPIs in the first year of the project in order to capture the local understanding of a successful transition to circular economy. Both sets of KPIs will be used to assess the fulfilment of the project participants' contract with the European Commission.

The disruption caused by COVID-19 also echoed throughout this project. Within a short time, pilot cities were forced to make sense of and respond to the situation, often with cancellations, postponements or revisions of planned activities. A risk assessment framework was implemented project-

wide to provide a space to reflect on the potential impact of the COVID-19 pandemic, not least via the performance indicators set for the pilot cities.

In this paper, we explore how accounting became involved in the response of the project's pilot cities to the current pandemic and how it influenced the diverse discourses and practices of governance in this unique situation. We rely on Foucault (2007) notion of "governmentality", which has been used by accounting scholars to explore the manifold implications of accounting in processes of control. Specifically, we are interested in ways governmentality research has shed light on accounting as a technology of governance mobilised by actors within the project and results in ways of assessing and governing the aftermath of COVID-19.

To this end, we explore the role of the two sets of KPIs, central and local, reflecting both the European and the cities' programmes for the definition and implementation of circular economy (Rose and Miller, 1992). Previous literature on governmentality has started to address the relationship between "central" and "local" programmes quite recently (see Ahrens *et al.,* 2020; Newberry, 2020). Thus far, studies on governmentality have highlighted the tensions between the KPIs as accounting technologies translating conflicting central and local programmes. However, little attention has been paid to the role of both programmes and KPIs in the assessment and management of an ongoing crisis such as the COVID-19 pandemic.

In order to explore the role of central and local KPIs in this setting, the paper relies on the "adjudicating" and "territorialising" roles of accounting (Miller and Power, 2013). Accounting plays an important "adjudicating" role in classifying, enumerating and comparing performance by making it part of accounting regimes (Miller, 2001; Miller and Power, 2013, p. 585). Moreover, accounting technologies create visibilities that make specific programme attributes manifest while obscuring others (Dean, 2010). In particular, KPIs render those attributes visible by making them calculable, thus constituting the space in which they operate("territorialising") (Miller, 1994).

Our paper aims at complementing the extant literature by exploring the role of KPIs as technologies of government guiding cities in the COVID-19 pandemic. It answers the question of how these technologies and practices of governing give rise to specific forms of visibility by making specific aspects of the pandemic calculable (Mennicken and Miller, 2012). Moreover, this paper seeks to understand the role of accounting technologies not only as a translation of local and central governmental programmes related to circular economy transition, but also as a social practice implicated in wider socio-political and -economic discourses and practices due to the current pandemic.

The remainder of the paper is structured as follows. Section 2 outlines the literature regarding the technologies of governance and accounting. Section 3 sets out the methodology, while section 4 illustrates the findings based on the cities' KPIs and the relative response to COVID-19. The concluding section presents the theoretical contribution and implications for literature and future research.

Accounting as a technology of government

Governmentality as a "systematic way of thinking about government" (Dean, 2010, p. 211) "render[s] reality thinkable" to make it "amendable to calculation and programming" (Miller and Rose, 2008, p. 16). In the work of Foucault, concerns with government and reality are incorporated into the technologies of government (Foucault, 2007; Raffnsøe et al., 2019). Governmental technologies can be considered "the complex of mundane programmes, calculations, techniques, apparatuses, documents and procedures through which authorities seek to embody and give effect to governance ambitions" (Rose and Miller, 1992, p. 175). However, technologies of government are "not a matter of the implementation of idealised schema in the real by an act of will, but the complex assemblage of diverse forces, [...] techniques, [...] devices [...] that promise to regulate decisions and actions of individuals, groups, organisations, in relation to authoritative criteria" (Rose, 1996, p. 42). This use of governmental

technologies contributes to rendering the world governable and individuals' calculable (Miller and O'Leary, 1987, 1994).

The role of accounting in governmentality studies enabled regimes to be assessed and made operable. Examples can be the way accounting allowed the implementation of new manufacturing technologies (Miller and O'Leary, 1994), influenced sustainable supply chain governance (Spence and Rinaldi, 2014) or enabled the development of consumer credit (Jeacle and Walsh, 2002). Accounting technologies produce specific forms of visibility through the "supposedly impersonal logic of quantification [that] configures persons, domains and actions as objective and comparable" (Mennicken and Miller, 2012, p. 7).

Government programmes are linked to accounting technologies for the realisation of their strategic ambition (Rose and Miller, 1992), thus performing their territorialising and adjudicating qualities (Mennicken and Miller, 2012; Miller and Power, 2013). The link between accounting technologies and government programmes has been explored within urban studies. For example, Argento et al. (2020) found that the multiple roles of these technologies hindered the development of the smart city programmes in the city of Helsinki. Moreover, Westerdahl (2020) explored the role of accounting technologies in the programme changes of the public housing sector in Sweden.

Notably, however, internal debates over the accounting technologies themselves and their link to central and local programmes have seldom been addressed (Rose and Miller, 1992; Ahrens *et al.,* 2020). To do so, this paper adopts a concept of control that reflects Foucault's (2007) view of governmentality as a dynamic set of techniques and forces "operating in a heterogeneous space, constituted through multiple determinations" (Collier, 2009, p. 99). This approach allows an understanding of governmentality not as an institution or a "dispositif" (Foucault, 2007) but as a modality of control characterised by dynamic tensions in the definition of programmes at the central, project level and at the local, city level.

The accounting literature on governmentality has started to explore the difference between central and local programmes and the relative KPIs as accounting technologies relatively recently. Examples include the Newcastle City Council's use of accounting to create new forms of counter-conduct aimed at reacting against austerity funding cuts (Ahrens et al., 2020). Moreover, tensions between accounting technologies at the individual entity and government levels have been analysed in the context of the reform of natural disaster funds in New Zealand (Newberry, 2020). Consequently, little is known about how accounting as a governmental technology plays a role in the definition and interpretation of programmes in the management of ongoing crises such as the COVID-19 pandemic.

To explore this element, this paper studies the role of accounting as a technology of government within the COVID-19 pandemic. The six cities involved relied on the central and local KPIs to assess and manage the impact of this unprecedented crisis and its socioeconomic and environmental repercussions.

Methodological approach and fieldwork

The empirical part of this paper originates from the field study of a large European project. The work on the project started in September 2017 with the definition of the consortium and the agreement on the project content. The project operations were officially commenced in June 2019. The project's aim is to enable cities' transition towards regenerative practices based on circular economy principles. The project consortium is composed of 28 partner organisations, including municipalities, academic institutions, makerspaces, small and medium-sized enterprises (SMEs), non-governmental organisations (NGOs) and citizen associations. The work of the consortium is led by a project coordinator who is directly responsible towards the European Commission. The consortium is organised into teams, broadly categorised on two levels as pilot cities and work packages. On the one hand, pilot city consortia at a minimum consist of municipality representatives, citizens' organisations and small and medium-sized enterprises (SMEs). On the other hand, at the project level, work packages

gather partners with a specific competency profile to support all pilot cities on various themes. Examples can be partners focussing on urban governance, sustainable technology or social, environmental and economic performance measurement and impact assessment. Individual roles of risk manager, scientific manager and technological manager are also assigned amongst project members to ensure quality results.

The authors who conducted the empirical part of the investigation attended all the official project meetings, where the whole consortium or various groups of partners such as cities, work package leaders, the risk manager and relevant stakeholders discussed the COVID-19 situation. Due to the pandemic, the meetings were held online using the Zoom platform. Zoom allowed the recording and transcription of all communication.

Following the comparative case study research approach (Yin, 2003), this part of the fieldwork resulted in 30 interviews lasting up to 90 min each conducted with the pilot cities and the relevant project partners. These interviews discussed the relevance of COVID-19 for the project in general and for the cities in particular. The key aspects that the cities focussed on were the "central" and "local" project KPIs and their ability to fulfil them during the pandemic. The interviews were conducted over Zoom and were recorded and subsequently transcribed. Moreover, internal notes were kept and shared by the researchers involved in the fieldwork, where the informal communication was recorded. This included concerns, attitudes and observed practices as well as personal notes. Meetings and interview data were compared and complemented with the data from the project's documentation: Grant Agreement, emails, meeting agendas and other official project documentation. Data have been analysed during the fieldwork and organised into various themes including the perceived severity of the impact of COVID-19, diverse rationales and programmes at central and local level, and prioritisation of project's vs pilot's programmes and KPIs. In the following section, attention will be given especially to the impact of the two categories of KPIs in assessing and managing the central and local programmes in the ongoing COVID-19 pandemic.

The cities and COVID-19

Each city participating in the project chose a specific problem to address within the realm of circular economy. For example, cities focus their projects on plastic, textiles, local municipal markets or energy efficiency. The aim is to have a city-centred approach to circular economy that will develop beyond the life of the project itself and can be replicated by other interested cities internationally.

The performance evaluation at the end of the project period will be based on two sets of indicators: the first one being the so-called "central KPIs", which were agreed upon during the development of the participants' contract with the European Commission ("Project Grant Agreement", 2019). The second type of indicators, i.e. "local KPIs", have been defined by the cities themselves in a process facilitated by two project member organisations.

Central KPIs are similar across all pilot cities; out of the set of nine KPIs, only two are city specific. These KPIs focus on the number of stakeholders reached by the project, their interest in replicating the processes and solutions designed in the project, the overall increase in the citizens' awareness and the improvement in the cities' overall welfare. The circular economy programme of government draws on central KPIs as accounting technologies to ensure that the solutions devised in the project are propagated to other international cities that consider them relevant and are willing to invest in them (Miller and O'Leary, 1994).

Furthermore, the cities created local KPIs on a voluntary basis to keep track of the elements that they considered central to the positive outcome of their programmes. The local KPIs have been defined by the cities in the first year of the project as technologies of government to achieve the circular economy objectives they consider desirable (Miller and Rose, 1990). These indicators are an outcome of a six-stage process, starting with a long-list of best-practice KPIs found across the industry practitioners, international organisations and well-known sustainability frameworks. The long-list was

then narrowed to a short set of KPIs through co-creation meetings between respective pilot cities and their primary stakeholders and a facilitator from the project (Parisi et al., 2020).

Characteristics and examples of the two types of indicators, "central" and "local", are presented in Table 1.

Central KPIs	Local KPIs
Characteristics: (1) Defined before project start in accordance with the requirements by the European Commission (2) Stated in the project contract (Grant Agreement) (3) Similar for all pilot cities with minor differences to reflect the material focus of the pilot cities	*Characteristics:* (1) Defined by the pilot cities during the project through a co-creation process (2) Communicated to the European Commission through one of the project's deliverables (3) Different for each city depending on their context and goals
Examples: P1: Number of material-specific city resources identified P2: Number of specific material streams identified P3: Number of governance/business models developed P4: % material regenerated P5: Overall stakeholder satisfaction with models P6: Number of new applications for material developed P7: Willingness to pay for regenerated products and materials P8: Number of local makers and businesses reached through showcases P9: Number of citizens reached through educational programmes	*Examples:* E1: Circular material use rate E2: Recycling rate of material at project sites E3: CO_2 emission change E4: Reduction in energy use S1: Number of citizens engaged in project activities S2: increase in awareness about circularity of materials amongst citizens

Table 1. Project KPIs. Table by authors.

The COVID-19 pandemic and the consequent containment measures, including full lockdown in some countries, did not leave the project unaffected. Not only did most of the work move online under social distancing guidelines, but also some key activities in pilot cities had to be cancelled or indefinitely postponed, placing on hold the implementation of the envisioned action plans. As we read in one of the project deliverables:"in [one of the cities], the municipal markets are closed, and in [another] all events have been cancelled for months ahead. Across all pilot cities, all outreach and communication activities that were designed to take place physically are cancelled" (Parisi et al., 2020).

In response to the disruption caused by COVID-19, several documents and meetings, including a "risk management register", management-level meetings and bilateral meetings between the pilot cities and project coordination team, have been used to make sense of the situation and to explore the feasibility of the existing programme as defined by the project Grant Agreement and by the cities' own regimes (Rose and Miller, 1992).

Initially, the situation was assessed by partners at the work package level (i.e. excluding pilot cities) at the "risk management meeting" and "work package meeting" on 19 March, and later on 25 March by work packages and pilot cities at a "steering committee meeting" including all the project partners. In all meetings, participants discussed both the central programme and the interest of the project continuing its operations, as well as the difficulties experienced by the pilot cities. The initial responses were mixed depending on the participant's role in the project.

On the one hand, the work packages and the internal risk management team were focussed on finding solutions that could be implemented for the project to continue operations and sought "measures [the project] could possibly take to minimise the risk of negative impacts" (Risk management meeting minutes, March 19 2020). Their approach was to "think about the competences [...] in the consortium [and] think creatively how [to] re-adjust activities to run online" (Steering Committee meeting minutes, March 25 2020).

On the other hand, pilot cities were more concerned about the feasibility of implementing their planned activities and the impact that COVID-19 would have on their operations. One member of a pilot city consortium argued that"it's a matter of completely shifting the scope, not a matter of postponement [...] we need to re-think the pilot plans"(Municipality representative in a pilot city consortium, March 2020). In another pilot city, the FabLab representative also raised concerns about their ability to move forward with the planned activities: "We are very impacted by the situation.We are completely closed, [...] some activities cannot be done online" (FabLab representative in a pilot city consortium, March 2020).

Overall, the initial response from the pilot cities to the uncertainty of the COVID-19 situation was pessimistic and driven by the feasibility of their KPIs. Shortly after the pandemic outbreak, it became clear that some tools would be necessary to make sense of and manage the situation. Hence, in late April 2020 the "risk management register" was implemented amongst pilot cities. The work package leader responsible for pilot coordination saw it as a good way to manage the situation:

"What I can say is that for now the template is working really well. We see a lot more... [pilot cities] can define a lot more details about their problems, and it really starts to emerge how similar they are in certain parts, and how different they are in others. So overall, it's quite interesting, and of course there are some red threads we can find common for everybody. For some cities, I think there is a lot more at risk than in others. [...] I think we've managed at least a little bit to take a detour and... everybody has been very creative [laughs]." (Designer and FabLab representative, coordinator of pilot cities, April 2020).

Two months later, in June 2020, bilateral meetings took place between the project coordination team and the pilot city teams. The aim of these meetings was to build on the positive experience of using the "risk management register" and further create perspective from which the situation could be assessed and managed through the accounting technologies available (Miller and Rose, 2008; Miller and Power, 2013). In so doing, both the central and local KPIs became a means to understand

the feasibility of concurrent programmes at central and local level (Miller, 1990). While the programme enforced by KPIs within the contract with the European Commission was considered more achievable, the local programme created by the cities themselves was considered more challenging.

During these bilateral meetings, pilot cities reflected on their ability to meet both sets of KPIs, expressing cautious optimism for the future of the project. For example, one of the pilot city team members described the central KPIs as "flexible" and envisioned a change in activities that would allow not only the meeting of the agreed upon target, but also exceeding the expectations due to their focus on replicability.

"[...] The indicators were pretty, pretty flexible. So, for example, we have indicators in terms of the public attitude. And yes, we were thinking about having a workshop with that number of people. But that number of people [...] can be online and offline, sometimes online. It's an opportunity to gather even more people if we think about that indicator." (Project manager in regional IT association, member of pilot city consortium, June 2020).

Further reflections on pilot cities' ability to meet the central KPIs were made, indicating potential changes to planned activities that would allow meeting the predetermined targets:

"Actually, it depends on the ways the situation is going to evolve in the next months. But I think it's fair to say we are on track for meeting the KPIs. Maybe, I do not know, if the situation will demand it, we will change live meetings with the public. We are going to change them and turn them into webinars. But I think that's about it. The rest of it is feasible." (Municipality representative, leader of a pilot city consortium, June 2020).

When it comes to the local programmes and relative accounting technologies, the cities found themselves with spaces for agency that were not envisaged in the immediate aftermath of the crisis. In fact, it seemed that local KPIs significantly affected the practices of government and the ability to respond to the local programmes (Ahrens et al., 2020). A team

member from the same pilot city consortium added a reflection on how the activities reflected in the KPIs were affected, and the city's reaction was as follows:

"One of the things we are monitoring [is] energy consumption... and we are including schools, and because in terms of the school activity, there was a disruption, we will pay much attention of how we interpret that data. [COVID-19] was a risk identified [...]. And if it goes for two more years, we will need to... it does not mean that we do not meet the indicators, just that we will need to adapt the interpretation of this based on the situation and the context of consumption, reduced consumption because of reduced activity." (Project manager of regional IT association, member of pilot city consortium, June 2020).

A project manager of another pilot city team echoed the ability to proceed with the project and meeting the local KPIs as follows:

"The indicator of a 25% increase in recycled [material] is still doable. COVID-19 was of course a setback, but we believe we'll get there at the end." (Independent consultant to the municipality, leader of a pilot city consortium, July 2020).

The central and local KPIs with their ability to create forms of visibility made COVID-19 calculable and governable. In fact, both the central and local KPIs, while responding to different regimes, identified distinctive possibilities for intervention and concealed other aspect of the pandemic (Mennicken and Miller, 2012). Hence, the accounting technologies played a territorialising and adjudicating role (Miller and Power, 2013) by making the COVID-19 subject to quantification and evaluation. In fact, KPIs as calculative practices devised in order to articulate and make both central and local programmes operable (Miller, 2001) and to assess their results (Miller and Power, 2013), created fields of visibilities that influenced the evaluation of the impact of the current pandemic. This role of the calculative practices in the project is also linked to the territorialising role of accounting; in that, the use of KPIs contributed to make COVID-19 subject to calculation (Miller and Power, 2013).

Initially, the cities' concern was the standstill of their activities, and the consequent inability to trial solutions in line with the city programmes. These were expressed by all pilot city teams; however, based on the both the central and local KPIs, the cities proposed a different practice and programme (Newberry, 2020), designed to address the expectations laid out by the performance indicators in innovative ways.

It was noticeable how pilot cities did not seem to distinguish between the central and the local KPIs, as the dynamic dialogue around the most relevant governmentality practices stemmed from both accounts (Foucault, 2007). After the initial pessimistic projections expressed during the Steering Committee meeting (25 March, 2020), the pilot cities moved ahead from the COVID-19 pandemic by revisiting KPIs and reformulating their programmes accordingly. Both sets of KPIs – "central" KPIs and "local" KPIs – were mentioned in cities' reflections about the way forward.

For example, a pilot city team now considered COVID-19 an opportunity to reconsider their plans and redesign scenarios to focus on the role of material flows during the pandemic:

"We were wondering [...] if something new would happen after the summer, we would probably have to reframe some content of the pilot. Not just because we cannot meet people live and so on, but maybe because if COVID-19 would come back, it would be very interesting and crucial also to reframe some of our activities and the conceptualisation of our pilots according to these." (Project manager in a municipality, member of pilot city consortium, June 2020).

Discussion and conclusions

This paper suggests that Foucault's notion of "governmentality" (Foucault, 2007) can be conveniently used to explore the role of accounting technologies in the COVID-19 pandemic. In line with this view on governmentality, it explores the ways programmes defined at the central level can be contested at the local level (Ahrens et al., 2020). This paper contributes to the accounting research on governmentality by offering examples of the roles of accounting in the competing regimes emerging

because of the COVID-19 pandemic. It illustrates how the perception of the gravity of the pandemic was influenced by the concurrence of central and local KPIs devised to implement the central and local programmes. Moreover, this paper contributes to the existing literature by exploring the respective roles of central and local regimes and the relative calculative practices. In fact, in our case, the cities never questioned the KPIs in the aftermath of the COVID-19 crisis but used them to shape their programmes in order to normalise the current situation.

The accounting literature presents examples of ways accounting technologies become associated with specific rationales (Hopwood, 1987; Power, 1997). It also provides accounts of the contradictory nature of rationales and programmes and the relative role of accounting (Miller and O'Leary, 1994). Notably, however, little attention has been paid to the complex process underlying such rationales and programmes, especially in the case of global, potentially long-lasting crises such as the COVID-19 pandemic. Findings of this paper illustrated how the central and local KPIs created to translate the European and the cities' programmes played a similar role in the assessment of the ongoing COVID-19 crisis. In fact, both sets of KPIs rendered some characteristics of COVID-19 visible and subject to assessment and evaluation; in other words, they played an adjudicating role (Mennicken and Miller, 2012; Miller and Power, 2013). The paper illustrates the underlying processes leading to the assessment of the impact of the pandemic through different stages involving the KPIs in order to adjust the relative programmes.

Finally, this paper contributes to the discussion concerning the territorialising quality of accounting (Miller and Power, 2013). In fact, this paper illustrates how KPIs contributed to the definition of COVID-19 as an accounting subject, thus making it calculable and manageable by the cities in the project.

Future research should investigate how different KPIs are devised and implemented both at the central and local levels. The interplay between the

actors involved in the definition of accounting technologies may contribute to our understanding of their use as governmentality technologies.

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Appendix 2

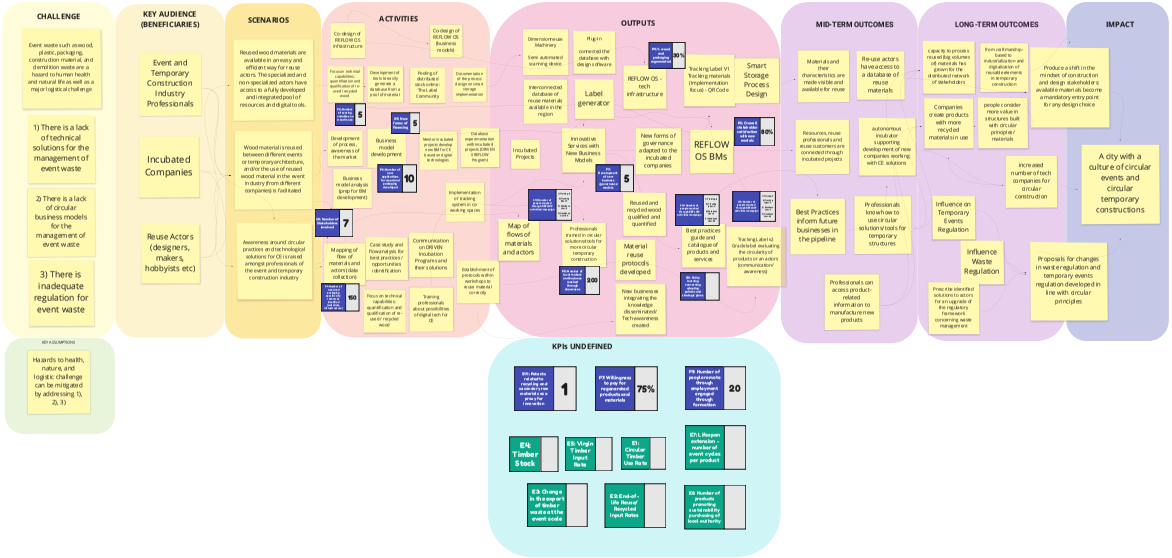

Figure 1. A Theory of Change visualisation developed by the city of Paris. Retrieved from an online whiteboard Miro.

Appendix 3

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Co-creation workshop	20/11/19	8	O	All		X	X	X	X	
Co-creation workshop	21/11/19	9	O	All		X	X	X	X	
Pilot visit - Vejle	10/12/19	6	O	Vejle		X				X
Steering Committee	11/12/19	1	O	Project		X			X	
WPL meeting	12/12/19	1	O	Project		X			X	
Paris pilot interview	06/01/20	1	I	Paris	X	X		X		
Cluj pilot interview	07/01/20	1	I	Cluj Napoca	X	X		X		
Vejle pilot interview	07/01/20	1	I	Vejle	X	X		X		
Milan pilot interview	08/01/20	1	I	Milan	X	X		X	X	
WPL meeting - AMS	09/01/20	7	O	Amsterdam		X	X			
AMS pilot interview	10/01/20	1	I	Amsterdam	X	X	X	X		
CBS-Metabolic-WAAG	13/01/20	1	O	Project	X	X		X	X	

[15] O = Observation, I = Interview

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Berlin pilot interview	16/01/20	1	I	Berlin	X	X		X		
Steering Committee	22/01/20	1	O	Project		X				X
ToC Q&A	22/01/20	1	O	All	X					X
WPL meeting	23/01/20	1	O	Project		X				X
ToC Q&A	23/01/20	1	O	All	X					X
WP1-WP3 call	03/02/20	1	O	Project	X	X		X	X	
AMS ToC workshop	04/02/20	1	O	Amsterdam	X		X	X		
Milan ToC workshop	05/02/20	1	O	Milan	X			X	X	
Cluj ToC workshop	05/02/20	1	O	Cluj Napoca	X			X		
Vejle ToC workshop	05/02/20	1	O	Vejle	X			X		
WPL meeting	06/02/20	1	O	Project		X				X
Berlin ToC workshop	06/02/20	1	O	Berlin	X			X		
Paris ToC workshop	12/02/20	1	O	Paris	X			X		
WP1-WP3 ToC review	13/02/20	1	O	Project		X			X	
CBS-Metabolic-WAAG	19/02/20	1	O	Project	X			X	X	
Steering Committee	20/02/20	1	O	Project		X				X
WPL meeting	20/02/20	1	O	Project		X				X

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Paris KPI co-creation call	25/02/20	1	O	Paris	X	X		X		
Milan KPI co-creation call	26/02/20	1	O	Milan	X	X		X	X	
Vejle KPI co-creation call	27/02/20	1	O	Vejle	X	X		X		
Cluj KPI co-creation call	28/02/20	1	O	Cluj Napoca	X	X		X		
WPL meeting	05/03/20	1	O	Project		X				X
Berlin KPI co-creation call	06/03/20	1	O	Berlin	X	X		X		
REFLOW project meeting	11/03/20	6	O	All	X		X		X	
REFLOW project meeting	12/03/20	4	O	All	X		X			
Milan ToC workshop	17/03/20	1	O	Milan	X			X	X	
Berlin ToC workshop	17/03/20	1	O	Berlin	X			X		
Cluj ToC workshop	18/03/20	1	O	Cluj Napoca	X			X		
Paris ToC workshop	18/03/20	1	O	Paris	X			X		
AMS ToC workshop	18/03/20	1	O	Amsterdam	X		X	X		
WPL meeting	19/03/20	1	O	Project		X				X
Vejle ToC workshop	20/03/20	1	O	Vejle	X			X		
Paris ToC workshop	24/03/20	1	O	Paris	X			X		

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Steering Committee	25/03/20	1	O	Project		X				X
Berlin ToC workshop	25/03/20	1	O	Berlin	X			X		
WPL meeting	02/04/20	1	O	Project		X				X
WPL meeting	16/04/20	1	O	Project		X				X
WPL meeting	30/04/20	1	O	Project		X				X
WPL meeting	14/05/20	1	O	Project		X				X
Steering Committee	20/05/20	1	O	Project		X				X
WPL meeting	28/05/20	1	O	Project		X				X
REFLOW project meeting	10/06/20	5	O	All	X		X	X	X	
REFLOW project meeting	11/06/20	5	O	All	X		X	X	X	
WP1-WP3 call	17/06/20	1	O	Project	X			X	X	
WPL meeting	25/06/20	1	O	Project		X				X
WP8 Paris meeting	29/06/20	1	O	Paris	X					X
WP8 AMS meeting	30/06/20	1	O	Amsterdam	X	X	X			
WP8 Vejle meeting	01/07/20	1	O	Vejle		X				X
Steering Committee	02/07/20	1	O	Project		X				X
WP8 Berlin meeting	02/07/20	1	O	Berlin	X	X				X

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
WP8 Cluj meeting	02/07/20	1	O	Cluj Napoca	X	X				X
WP8 Milan meeting	02/07/20	1	O	Milan	X	X			X	
WPL meeting	23/07/20	1	O	Project		X				X
Cluj KPI co-creation call	30/07/20	1,5	O	Cluj Napoca	X	X		X		
WPL meeting	06/08/20	1	O	Project		X				X
Berlin KPI co-creation call	13/08/20	1,5	O	Berlin	X	X		X		
Vejle KPI co-creation call	18/08/20	1,5	O	Vejle	X	X		X		
WPL meeting	20/08/20	1	O	Project		X				X
AMS KPI co-creation call	31/08/20	1,5	O	Amsterdam	X	X	X	X		
Milan KPI co-creation call	02/09/20	1,5	O	Milan	X	X		X	X	
WPLs-AMS meeting	03/09/20	1	O	Amsterdam	X		X	X		
Steering Committee	09/09/20	1	O	Project		X				X
Paris KPI co-creation call	09/09/20	1,5	O	Paris	X	X		X		
WPLs-Vejle meeting	16/09/20	1	O	Vejle	X			X		
WPLs-Paris meeting	17/09/20	1	O	Paris	X			X		
WPLs-Berlin meeting	17/09/20	1	O	Berlin	X			X		

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Vejle ToC workshop	18/09/20	1,5	O	Vejle	X			X		
Milan ToC workshop	23/09/20	1,5	O	Milan	X			X	X	
Cluj ToC workshop	23/09/20	1,5	O	Cluj Napoca	X			X		
Paris ToC workshop	25/09/20	1,5	O	Paris	X			X		
AMS ToC workshop	30/09/20	1,5	O	Amsterdam	X		X	X		
Berlin ToC workshop	30/09/20	1,5	O	Berlin	X			X		
WPLs-Milan meeting	01/10/20	1	O	Milan		X		X	X	
WPLs-Cluj meeting	01/10/20	1	O	Cluj Napoca	X			X		
Paris ToC workshop	07/10/20	1	O	Paris	X			X		
REFLOW project meeting	21/10/20	5	O	All	X		X		X	
REFLOW project meeting	22/10/20	5	O	All	X		X		X	
WPLs planning pilot telcos	26/10/20	3	O	Project		X				X
WPLs-Paris meeting	29/10/20	1	O	Paris	X			X		
Steering Committee	04/11/20	1	O	Project		X				X
WP1-WP5 meeting	10/11/20	1	O	Project		X				X

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
WPLs-Cluj meeting	12/11/20	2	O	Cluj Napoca	X			X		
WPLs-Berlin meeting	26/11/20	2	O	Berlin	X			X		
WP1-WP5 meeting	07/12/20	1	O	Project		X				X
WPLs-Vejle meeting	10/12/20	2	O	Vejle	X			X		
WPL meeting	07/01/21	1	O	Project		X				X
WPLs-Milan meeting	19/01/21	2	O	Milan		X		X	X	
WPLs-AMS meeting	21/01/21	2	O	Amsterdam	X		X	X		
AMS ToC workshop	09/02/21	1,5	O	Amsterdam	X		X	X		
WP1-WP5 meeting	10/02/21	1	O	Project		X				X
Milan ToC workshop	15/02/21	1,5	O	Milan	X			X	X	
REFLOW project meeting	23/02/21	5	O	All	X		X		X	
REFLOW project meeting	24/02/21	5	O	All	X		X		X	
Vejle ToC workshop	25/02/21	1,5	O	Vejle	X			X		
Berlin ToC workshop	26/02/21	1,5	O	Berlin	X			X		
Cluj ToC workshop	02/03/21	1,5	O	Cluj Napoca	X			X		
WPL meeting	04/03/21	1	O	Project		X				X

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Milan KPI check-in	08/03/21	0,5	O	Milan	X	X		X	X	
Paris ToC workshop	09/03/21	1,5	O	Paris	X			X		
Cluj KPI check-in	16/03/21	1	O	Cluj Napoca	X	X		X		
WPL meeting	18/03/21	1	O	Project		X				X
REFLOW review meeting	22/03/21	4	O	All		X	X			
REFLOW review meeting	23/03/21	4	O	All		X	X			
WP1-WP3 call	26/03/21	0,5	O	Project		X			X	
WP1-WP3 call	30/03/21	1	O	Project		X			X	
WPL meeting	01/04/21	1	O	Project		X				X
Co-design workshop	14/04/21	6	O	All	X		X		X	
Co-design workshop	15/04/21	6	O	All	X		X		X	
WPL meeting	29/04/21	1	O	Project		X				X
WPL meeting	13/05/21	1	O	Project		X				X
WPL meeting	27/05/21	1	O	Project		X				X
Steering Committee	09/06/21	1	O	Project		X				X
WPL meeting	10/06/21	1	O	Project		X				X
REFLOW project meeting	16/06/21	5	O	All	X		X		X	
REFLOW project meeting	17/06/21	5	O	All	X		X		X	

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
WPL meeting	24/06/21	1	O	Project		X				X
Berlin KPI check in	29/06/21	0,5	O	Berlin	X	X				X
WP1-WP3 call	02/07/21	1	O	Project		X				X
WPL meeting	08/07/21	1	O	Project		X				X
WP1-WP5 meeting	13/08/21	1	O	Project		X				X
WPL meeting	19/08/21	1	O	Project		X				X
SROI internal meeting	27/08/21	1	O	Project		X				X
SROI internal meeting	30/08/21	1	O	Project		X				X
WPL meeting	02/09/21	1	O	Project		X				X
SROI internal meeting	06/09/21	1	O	Project		X				X
SROI internal meeting	13/09/21	1	O	Project		X				X
WPLs-Paris meeting	13/09/21	1	O	Paris	X			X		
WPL meeting - AMS	16/09/21	7	O	Project		X	X			
WPL meeting - AMS	17/09/21	7	O	Project		X	X			
SROI internal meeting	20/09/21	1	O	Project		X				X
SROI internal meeting	27/09/21	1	O	Project		X				X
WPLs-Vejle meeting	04/10/21	1	O	Vejle	X			X		

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Milan pilot interview	06/10/21	1	I	Milan	X				X	
Paris pilot interview	06/10/21	1	I	Paris	X					X
Vejle pilot interview	06/10/21	1	I	Vejle	X					X
REFLOW project meeting	06/10/21	3,5	O	All	X		X	X	X	
AMS pilot interview	07/10/21	1	I	Amsterdam	X		X			
Cluj pilot interview	07/10/21	1	I	Cluj Napoca	X					X
Berlin pilot interview	07/10/21	1	I	Berlin	X					X
REFLOW project meeting	07/10/21	4	O	All	X		X	X	X	
WPL meeting	14/10/21	2,5	O	Project		X				X
WPL meeting	28/10/21	1	O	Project		X				X
Pilot visit	08/11/21	7	O	Milan		X			X	
Pilot visit	08/11/21	1,5	I	Milan		X			X	
Pilot visit	09/11/21	7	O	Milan		X			X	
Pilot visit	09/11/21	1	I	Milan		X			X	
WPL meeting	11/11/21	1	O	Project		X				X
WPLs-AMS meeting	22/11/21	1	O	Amsterdam	X		X	X		
WPL meeting	25/11/21	1	O	Project		X				X
WPLs-Cluj meeting	29/11/21	1	O	Cluj Napoca	X			X		

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
WPLs-Milan meeting	06/12/21	1	O	Milan	X			X	X	
SROI Berlin meeting	07/12/21	1	O	Berlin		X				X
WPL meeting - CPH	09/12/21	7,5	O	Project		X				X
WPL meeting - CPH	10/12/21	5,5	O	Project		X				X
WPLs-Paris meeting	13/12/21	1	O	Paris	X			X		
WPLs-AMS meeting	03/01/22	1	O	Amsterdam	X		X	X		
WPL meeting	06/01/22	1	O	Project		X				X
SROI internal meeting	10/01/22	1	O	Project		X				X
WPLs-Cluj meeting	10/01/22	1	O	Cluj Napoca	X			X		
SROI internal meeting	17/01/22	1	O	Project		X				X
SROI AMS meeting	17/01/22	0,5	O	Amsterdam		X	X			
Project meeting - Paris	19/01/22	7	O	All		X	X		X	
Project meeting - Paris	20/01/22	6,5	O	All		X	X		X	
SROI internal meeting	24/01/22	1	O	Project		X				X
Milan employee 2	23/09/22	0,5	I	Milan	X			X	X	

Meeting	Date	Time (h)	Method[15]	Primary relevance	Recording	Notes	Article 1	Article 2	Article 3	Context
Milan Fab Lab member 2	23/09/22	0,5	I	Milan	X			X	X	
REFLOW project manager	27/09/22		I	All	X			X		
Milan employee 1	27/09/22	1	I	Milan		X		X	X	
Environmental consultant 1	30/09/22		I	Project	X			X		
REFLOW pilot cities coordinator	04/10/22		I	Project	X			X		
Milan Fab Lab member 1	10/11/22	0,5	I	Milan	X			X	X	
Environmental consultant 2	11/11/22		I	Project	X			X		
REFLOW project officer	21/11/22		I	Project	X			X		
Amsterdam employee 1	22/11/22	1	I	Amsterdam	X			X		
Amsterdam non-profit member 1	22/11/22	1	I	Amsterdam	X			X		
Vejle non-profit member 1	23/11/22	0,5	I	Vejle	X			X		

Appendix 4

Group interviews round 1

Theme	Topic
Circular economy	Topic 1: What is your understanding of circular economy? How do you make sense of circular economy and issues related to it? Topic 2: What was the pilot situation at the outset of the project? What problems were you aiming to address with solutions based in circular practices? Topic 3: What challenges do you face in the implementation of circular economy? Topic 4: What would success be for your initiative?
Social impact assessment	Topic 1: Dialogue about people-centered approach and social impact measurement Topic 2: Theory of Change

Group interviews round 2

Theme	Topic
Devices ("resources") used in the project	Topic 1: Use of resources Which resources have you used/not used in the project? [Resources identified prior to interview: KPI calibration, Theory of Change, Data visualization, Knowledge hub, REFLOW Forum, Value flows modelling, Social and economic impact assessment,

	Business modelling, MFA, Collaborative governance toolkit, Butterfly diagram, KUMU, REFLOW OS] Have you used any resources beyond these identified already? Topic 2: Discuss most used resources How have you used it and how was the experience? Why did you use it? How did it provide value? What did you wish to achieve with this resource? Topic 3: Characteristics of the resources What was difficult? What was easy/intuitive? What worked best/worst? What would be needed for the tool to be more useful for your initiative?

Individual interviews

Theme	Topic
Pilot team composition and collaboration	What organizations were directly involved in your pilot? (both formally part of REFLOW and outside of it) Specifically on what activities did you collaborate with organizations in and outside the REFLOW project?
Defining performance	What is a 'good performance' in a circular city / circular economy initiative?

	What would be considered a success for REFLOW as a project? What would be considered a success for your team in REFLOW?
KPIs	How did you use KPIs in the project? Did any other activities influence how you selected/changed KPIs in the project? Did the KPIs influence how you approached/conducted other activities in the project?
Sustainability performance – environmental, social, and economic aspects	How important were sustainability considerations in your/your teams' work? Did you consider the three aspects of sustainability (environmental, social and economic) when defining KPIs? Did you consider them in other tools used (Theory of Change, SROI, action tracker, etc.)
Tools, methods and frameworks used	Which tools and frameworks used in the project were helpful to track performance? Which ones reflected your performance best? Did you make any changes to the frameworks or tools to better fit your/your teams' needs? In hindsight, would you make any changes to the tools and frameworks that were available? Would you use other tools and frameworks?

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