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# Introduction



Martin de Jong, Daan Schraven, Anne Hofmann, and Liang Dong

**Abstract** This chapter provides the background of this book's topic. It does so by explaining how informal waste picking and urban formal waste infrastructure systems are both relevant to realizing an effective inclusive and circular economy at the urban scale, but that bringing them together does not occur automatically in the policymaking process. It provides a conceptual model that clarifies how the different components of the urban waste management system are connected, clarifies the logic underlying the structuring of the book into the various chapters that follow and then proceeds to present a brief outline of what each of those following chapters will be dealing with.

**Keywords** Informal waste pickers · Circularity · Inclusion · Urban waste infrastructure management system · Overview of the chapters

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Whoever is attentive and attuned to the phenomena can sometimes spot them: unknown and somewhat shy individuals operating nearby public litter bins and garbage containers scavenging for useful elements they expect can be collected and sold at a reasonable price. We know them as informal waste pickers. In the larger cities of most developing countries, they are in fact quite common and contribute significantly to the reuse and recycling of materials that would otherwise end up incinerated or landfilled [3]. For example, informal waste pickers were found to have a crucial role in Accra (Ghana) and Porto Alegre (Brazil) in the implementation of waste policies in these cities [1]. In wealthier countries they have been mostly absent for decades but represent something reemerging now that urban migrants and underclasses have lost purchasing power year after year and have become reliant on it. However, the academic debate around informal waste pickers in wealthier countries focuses on discrimination, stigma, and social exclusion, and less on their environmental contributions or how they can be included in the formal waste management processes [7].

The role of informal waste pickers is set to become a lot bigger due to a few recent trends. First of all, the overall population of cities is growing. In 2020, already 55% of the world's population lived in cities, and this proportion is expected to increase to 68% by 2050 [2]. And as waste generating enterprises, cities harbor a diverse set of people with different urban lifestyles, which is likely to increase the amount and complexity of municipal waste [4, 8].

Second, both emerging and mature economies are busy introducing policies to realize circular economies for themselves but handle those transitions in different ways. In emerging economies, governments recognize the existence of the informal waste picker. However, they choose to implement policies to strengthen waste collection and processing rather through official channels. For example, China has introduced quite a few policies and formal enforcement mechanisms through legislation and market regulation for e-waste, creating a further disconnect with the informal recycling sector [9]. This goes potentially at the expense of the informal sector although there also appear opportunities to integrate them into a more complete and comprehensive waste management system.

In economically mature countries in Europe, such as the Netherlands, where waste collection systems are more advanced, their recent appearance makes most citizens somewhat uncomfortable but their market opportunities as such appear satisfactory as their growing numbers are showing. For example, legislation affecting the circular economy is enacted including extended producer responsibility banning single use plastics, mandating labelling on plastic products and promoting waste sorting and public awareness [6]. This helped to introduce deposits for cans and plastic bottles as a refund system, which inspired people to start collecting these bottles and bring them to the supermarket. In these ways they may well constitute a major underestimated asset to the future of the circular economy.

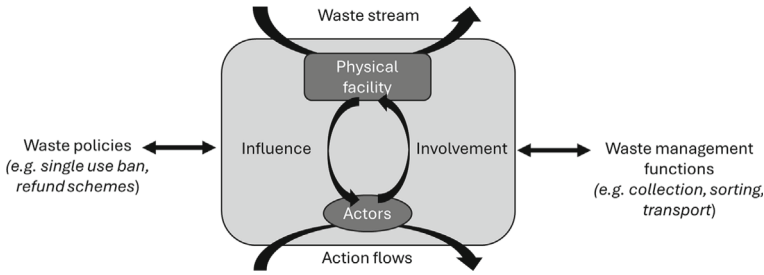
Both urbanization and the transition to a circular economy instill the need to find effective waste management policies and their effective implementation into sustainable circular practices of production and consumption. It evokes the question how the inclusion of informal waste collection activities be organized and made part

of an integrated and well-functioning circular economy? The academic literature in urban and environmental studies of recent years pays ample attention to the mapping, measurement and implementation of policies promoting the circular economy. In the social and behavioral sciences, the relative importance of conceptualizing and realizing various types of inclusion has shown an enormous increase. What is far less common is to build the analytical connection between these two developments although the value of that has become more and more apparent.

The value seems to lie in the unification of the goals that both movements toward circularity and inclusion have. On the one hand environmental and spatial aspects seem to be well-connected with each other, sometimes even unified into one perspective. Closing the circle from delving resources from the natural environment through manufacturing, sales, consumption and disposal decreases the amounts of waste dumped into urban and rural space and reinserts potentially valuable materials back into the production and consumption process and boosts spatial and environmental inclusion. On the other hand, unification can be considered far more indirect on the various aspects of social, political and economic inclusion. These inclusion aspects give vulnerable groups a say in decision-making as to how the chain of handling materials from cradle to grave is organized, which is also clearly of major value to realizing higher levels of circularity in the economy.

One could ask under which type of economic system this unification can best be reached. Along the entire chain of exploitation, production, distribution, consumption and end of cycle, it is conceivable that enormous economic and ecological gains are obtained if circularity and inclusion are considered in combination. But in practice, things appear not that simple. On the one hand, the dominant capitalist practice of letting 'laissez-faire' market operations determine whether and where business opportunities emerge following a 'spontaneous order' tend to leave the identification of opportunities for inclusive circularity or circular inclusion to mere chance. On the other hand, heavy-handed government policies in which large-scale formal waste processing prevails over more detailed informal collection through marginal groups in society also overshoot their target: technology and engineering prowess alone are not always the answer to societal problem-solving either.

Is the city the appropriate focal point for change proposals? The urban level is many ways indeed the integrating scale for policy and practice. There are a few reasons that can be purported for this. First, waste generation is concentrated in the urban environment, as citizens generate waste in their households, and keep this in the urban vicinity. Second, at the city level, more comprehensive policies adopted at the national scale can be adopted, amended and implemented in their local context. Finally, the city level harbors the operational processes that require the intervention, for instance the infrastructure and logistics that are effectively established and governed at the urban and regional scale. Following these arguments would lead us to suggest that the city is a fruitful focal point to learn about an effective mesh of policies and practices for circularity and inclusion. As the city is suggested to the point of departure, the central question addressed in this book is raised as: *How should a city govern the entirety of its urban waste management system such that it achieves inclusive and circular aspirations?*



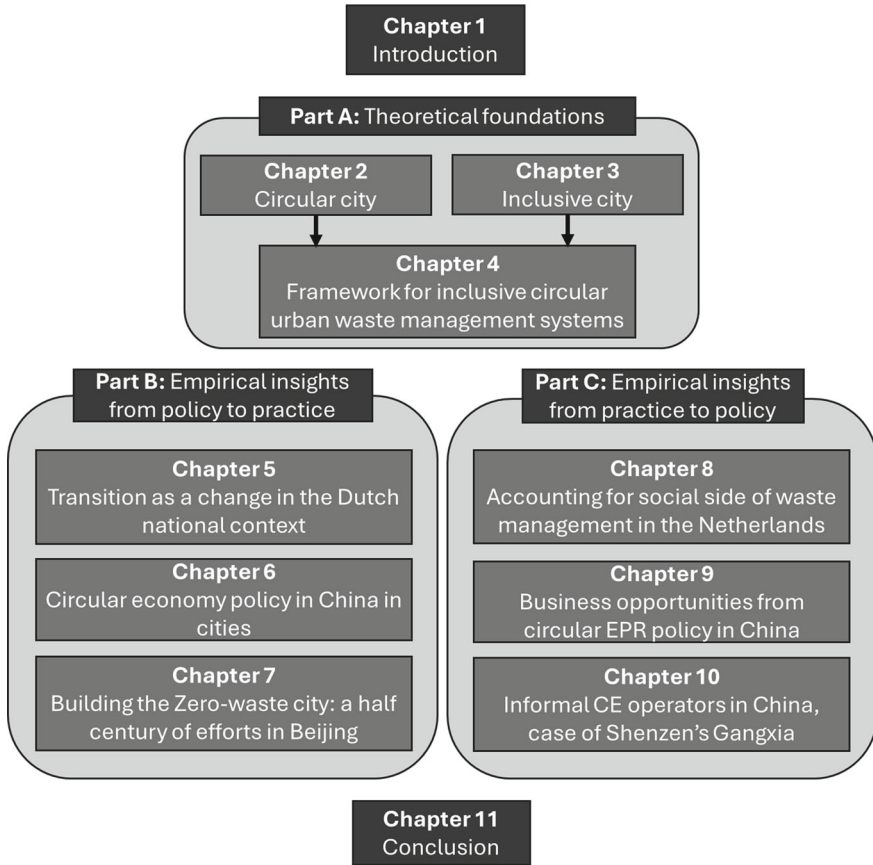
**Fig. 1** Schema of urban waste management system, adapted from Liu et al. [5]

In essence, what is required is that waste management facilities are considered part of a broader systems perspective: individual elements such as (1) physical facilities, stocks and flows of materials, water and energy and (2) public, civil and private sector players that operate, own and control them as well as (3) the mutual relations these objects, infrastructures and urban and industrial actors have with each other need to be identified, categorized, mapped, structured and eventually reorganized.

It is only when developing the complete picture of how everything hangs together that possibilities to restructure elements and relations become fully visible and system performance can potentially be optimized. This is more easily said than done: knowing what a well-performing waste management system looks like is not tantamount to realizing it because one or more actors enjoying vested interests in the system and hampering change may have to be induced or forced to change. However, knowing at least is a first step to making transformation a future possibility.

This book approaches the topic of inclusive circular urban infrastructure systems. Liu et al. [5] described the building blocks of an urban waste management system from the municipal solid waste's perspective. Figure 1 shows a schematic representation of the urban waste management system. In the center there are two main blocks: physical facilities and actors who are interrelated in the process of managing waste. The public, civil and private actors are involved in (un)intended management functions, like collecting, sorting and transporting waste to a physical facility (e.g. sorting facility, recyclers), where the characteristics and laws (e.g. refund schemes or sorting requirements) that guide these facilities influence the ability of actors to perform those functions. The waste streams and actor activities serve as connectors to other physical facilities.

Following these building blocks of the urban waste management system, this book systematically examines what the academic literature has to say about circular urbanity, inclusive urbanity, synthesizes insights from both into a comprehensive framework enabling us to analyze waste infrastructure management systems at the urban scale. It subsequently offers a variety of empirical cases and examples from China and the Netherlands that illustrate what urban waste infrastructures look like, how they function, what options there are to improve their inclusiveness and levels of circularity, in which national contexts they are embedded and what lessons other cities can draw from them.



**Fig. 2** Structure of the book

This overarching approach is structured in the book through three main parts (Fig. 2). The first part (A) addresses the theoretical foundations to develop an overarching framework for inclusive circular urban waste management systems. The following two (B and C) parts then use these theoretical underpinnings to discuss empirical insights from six cases on circular policy initiatives and their implications for waste management practices, and vice versa. The next sections narrate the particular points of attention in each of the following chapters and highlight some of the key take-aways.

# 1 Theoretical Foundations

Part A touches base on the theoretical foundations of circularity ambitions of a city, by studying the academic literature through bibliometrics and content review on the concepts of circular cities (Chapter 2) and inclusive cities (Chapter 3) and then designed a framework that encapsulates the requirements of an inclusive circular urban waste management system (Chapter 4).

Chapter 2 addresses the concept of the circular city. It departs as to why circularity is warranted: population is expected to grow in cities, setting expectations on increased amount and complexity of municipal waste. The circular economy is an alternative to the take-make-dispose economy by turning waste into resources. The chapter reviews how cities should become effectively circular as to when circular strategies are adopted. It contributes academically in terms of defining the circular city. Besides adopting circular strategies, the chapter finds that the built environment can also be strengthened in terms of its adaptation and inclusion of nature in the urban setting, suggesting the need for urban regeneration. Chapter 2 operationalizes the circular city by offering five dimensions, including a system description, the components, principles, goals and organization.

Chapter 3 reviews the inclusive city. It departs from the observation that municipalities often brand themselves as inclusive. Then it finds that inclusivity as a concept is not unique to any one field, but actually serves a great variety of inclusion types. Chapter 3 posits that inclusion interacts with its antonym, called exclusion, through which it becomes apparent that there are always two sides to coin for actors in terms of being privileged by being included or underprivileged by being excluded from a certain function. Chapter 3 proposes to look more anatomically into in what ways people are excluded from benefits, facilities or privileges. The chapter contributes by systematically examining what an inclusive city exactly entails, how it can be defined, the various dimensions that it has and how it can be achieved. The chapter presents a framework for an inclusive where it describes six dimensions of inclusion, i.e. spatial, social, environmental, economic, political and cultural inclusion.

To curb the high waste generation, Chapter 4 develops the conceptual framework by taking the schema of urban waste management systems and projecting aspirations of inclusion (from Chapter 3) and circularity (from Chapter 2) on it. Using the combination of the two views, Chapter 4 purports that a city actually needs to take more responsibility towards people and the natural ecosystem that surrounds the city in its pursuance of inclusion and circularity of waste management. This hints at an important implication in that waste management needs to be redefined as a resource collection and distribution network. In this way it is expected that a city can avoid a potential lock-in of its waste management infrastructure. This signifies a disability to make changes to the function of the system, like including local stakeholders in long term investments. The framework of chapter 4 is designed to include steps that help develop circularity principles whereby all stakeholders act responsibly and adhere to inclusive principles.

## 2 Empirical Insights from Policy to Practice

Part B makes a deep dive into three cases that describe empirical insights on the level where policy initiatives have implications for the waste management practices from the Netherlands and China. The chapters reveal how policies can direct changes in the Netherlands (Chapter 5) and China (Chapter 6). In addition, it also shows how effectuating policy changes becomes more difficult if the goals need to be upgraded by a fundamental scope expansion to better capture existing practices (Chapter 7).

Chapter 5 investigates the principles of transition management as they apply to changing an urban waste management system into a circular and more resilient one. It examines the different types of policies and practices in the Netherlands that have the potential to be used for a transition toward a circular waste management system. The chapter describes the history of waste management in the Netherlands in relation to its demographics in cities. It illustrates the need in the Dutch context for fundamental changes. Chapter 5 takes the transition management model as a systemic approach to analyze this long-term transformation of the Dutch waste management system. It thereby reviews the Waste Disposal Act of 1975 and the National Waste Management Plan of 1992 and recent developments that emerged in light of the circular economy transition.

Chapter 6 presents an analysis of the circular economy policies in China that were issued between 2006 and 2022 and shows how the government issued and implemented an increasing number of these over time. In particular, the 13th Five Year Plan (2016–2020) reveals a sudden increase in wide variety. It specifically notes the evolution of intensity from CE pilots to national demonstration cities to zero-waste cities. In content, Chapter 6 unveils why there was a shift in these policy attributes from a primary focus on production efficient to the adoption of a whole life cycle perspective, that spans across the supply chain. One of these reasons includes the rapid economic development and urban population growth between the 1980s and 2020s. Another reason turns out to be completing the connection of more restricted waste handling policies to the broader circular economy ambition which were already hinted at since the 1990s with synonyms such as cleaner production, industrial ecology and ecological modernization, but only appear in view more recently.

Chapter 7 presents a case study of Beijing as a long-time development of its urban waste management system with its parallel transformation of the informal recycling sector since marketization in late 1970s. It discusses the focus of policies to address environmental and resource challenges, yet these initially excluded the migrant scavengers from their local policy efforts. In essence, the challenge has become how the informal recycling sector needed to be integrated within the modernization of the existing urban waste management system. This case underscores the limitations of applying a merely linear approach from policy to practice and warrants a focus on empirical insights derived from the reverse relationship.

### 3 Empirical Insights from Practice to Policy

Part C then delves into three cases that describe empirical findings on the level where waste management practices have implications for circular policy making for the Netherlands and China. The chapters reveal how waste management practices can be better understood by following their social processes as waste is handled in daily practice (Chapter 8), and what the organic reaction to new opportunities is from the informal sector when new legislation is introduced to waste management practices (Chapter 9). Finally, Chapter 10 discusses how the achievement of circularity and inclusion can backfire if a policy does not allow the organic adaptation of waste management practice in case official state-led policies are put in place.

Chapter 8 argues that enhancing waste management practices requires analytical tools capable of observing the social dimension of those practices. The chapter proposes a method to include this dimension and then applies it to the waste management practices following two Dutch household renovation projects. The approach, called Waste Journey, offers a way to map the social processes on waste handling, showing where certain events in social processes can be ringfenced as areas for improvements. Chapter 8 contributes as a new tool a qualitative method to a field primarily dominated by quantitative applications. The chapter highlights the additional attention that the method can provide in terms of describing and revealing the role and impact of different actors as they interact with waste and shape the actual waste management practices. Particularly human reasons behind certain challenges regarding the inclusion and circularity of the waste management practices are laid bare through using this method.

Chapter 9 illustrates the emerging business models for post-consumer recycling in urban China facilitated by internet technology. It signifies that business model innovation is booming there in recent years. Chapter 9 found three types of emerging business models related to waste handling: (1) community-based programs, (2) reverse logistic systems, and (3) pure internet solutions to bridge transactions between consumers and recyclers. The chapter describes that five elements are key to the viability of the business models in post-consumer recycling, including consumer convenience, producer traceability, recycler profitability, hybrid collection practices and information reliability. Chapter 9 finds that the introduction of the extended producer responsibility in China (originally from the European Union) has been the trigger for this wild bursting growth of business models. The chapter draws lessons from how other countries can foster business opportunities by adopting and translating policies into their waste management practices.

Chapter 10 stipulates that for both the urban government and corporate actors, informal recycling is a pivotal sector for waste management practices. The informal recycling sector helps these actors to shape value chains around the waste management and help achieve circular lifetime extension strategies for consumer goods. In this effort, the chapter reveals how the formal state-based policies in fact aim at the orchestration of the same waste management practices as the informal recycler sector caters for. Through this it demonstrates how the achievement of circularity

faces extra challenges caused by this duality. The chapter describes how both sides are organized from different continuation logics. In effect, it is discussed why the informal recycling sector actually contributes more to inclusive and circular waste management practices than the state-orchestrated efforts. It unveils that inclusion also needs organic attention from ongoing practices to inform and shape policy.

Final and concluding Chapter 11 takes stock of the main theoretical and empirical take-aways from the book. It looks back at the various chapters, draws the key lessons from them and connects all the dots by offering a Plan-Do-Check-Act approach to bring the formal and informal sectors operating in the Urban Waste Management System (UWMS) together and examining what role they play in it, to which physical parts of the system they are linked and what policy changes and other inducements it would take to strengthen their productive participation within it. All too often, official policies ignore their essential contribution to both inclusion and circularity. More generally, it emphasizes the productive use of applying a systems approach for transitioning to an inclusive circular UWMS.

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