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# Circular Economy as Infrastructural Change: Waste Citizenship in the Bin

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## INTRODUCTION

Waste infrastructure, including wastewater treatment and solid waste management, is one of the most significant infrastructures of modern society. Its purpose is to manage material overflows inevitably generated by human beings through consumption in such a way as to prevent negative environmental impacts of waste—e.g. hygiene-related risks, environmental pollution and overuse of natural resources—and to support the continuity of the consumption-driven lifestyle of the Western world that generates immense quantities of waste.

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The modern waste infrastructure is perceived as determined largely by the same principles that determine other infrastructures: It is designed to be invisible, part of the background for other kinds of work (Star, 1999), and it works without much effort or participation of its users (see e.g. Hawkins, 2006; Offenhuber, 2017). Although the modern waste infrastructure has a great deal in common with other key infrastructures of today's society, such as electricity and water distribution systems, it also has its distinctive characteristics. The waste infrastructure intended for the purpose of managing solid waste does not function without waste work performed by citizens and, thus, for them it cannot be entirely invisible, let alone a passive environment of everyday life. Here we highlight the role of the bin as a concrete tool of activating citizens and integrating them into the framework of waste management as an acknowledged part of the system.

The bin is the most familiar and mundane object through which we encounter waste in everyday life (Chappells & Shove, 1999; Metcalfe et al., 2012). Everyone knows how to use the bin, and what it is for. It is an established instrument of waste management in households as well as at the institutional level. While for households, the bin is an important technology of handling and managing their surplus, from the perspective of institutional waste management, it is a functional tool to take care of the flows and management of waste streams in society. As Heather Chappells and Elizabeth Shove (1999, p. 269) have demonstrated, the bin has an essentially double structure: By virtue of its position at the borderline between the private and the public, the bin functions as an important link between individual households and the public waste management system. According to Taru Peltola and Maria Åkerman (2012, p. 52), the bin combines the aim of waste governance to handle waste in an efficient and hygienic manner with people's need to dispose of their household waste. This means that the bin is more than merely an object: It is a central part of the modern waste infrastructure and its function.

When bin is used in right manner, and waste infrastructure functions the way it should, the ordinary flow of everyday life is ensured. However, against the backdrop of recent developments, the modern waste infrastructure of the Western world is experiencing considerable pressures to change. In terms of governance, the change has been concretized in the EU's 2015 Circular Economy Action Plan—the first of its kind. Although CE is an extensive environmental and economic policy programme, so far, its implementation has been primarily through waste infrastructural

changes. In this chapter, we explore some of the ways in which this change has manifested itself. Our previous studies have confirmed the important role of the citizen in waste governance, and here our focus will be on the kind of citizenship waste infrastructural change is producing. The subject is approached through the concept of the bin, which, as Metcalfe et al. (2012) have argued, has an agentive role in waste infrastructures.

The theory of mundane governance by Steve Woolgar and Daniel Neyland (2013) forms the theoretical foundation of this study. Our starting point is the idea that various governance measures targeted at waste and waste infrastructures shape reality, which, in turn, transforms the ontology of waste. We have selected the bin as the focal point of our investigation because it is precisely *in the bin* that the governance measures become concretized. Thus, examining the bin as part of the modern solid waste infrastructure allows us to unravel the kinds of infrastructural agency waste governance in the current landscape of circular economy offers to and requires of the citizen. By virtue of its position at the intersection between public waste infrastructure and the citizen's private waste practices, the bin ends up shaping both. In other words, the bin is ascribed the ability to shape not only waste infrastructure but also citizenship.

It has been argued that attuning to the agency of non-human elements is essential for teasing out the complexities of contemporary environmental issues (Nustad & Swanson, 2022). Therefore, in order to investigate citizenship in CE, we need to take seriously not only human agency but also the agency of infrastructural technologies. In what follows we recognize the active role of bins in the infrastructural waste assemblage and ask: How does the agency of the bin shape citizenship in CE?

The views presented here draw from our previous studies conducted within the *Waste Society: living with material overflows* project ([www.wastesociety.com](http://www.wastesociety.com)) in which we have addressed the regional realization of waste governance and waste policy in the context of Finnish Lapland as part of the larger framework of the EU's circular economy policy. During the project, we have examined (1) the role of citizenship in waste governance in circular economy based on a total of 25 interviews with Lapland-based waste actors (Valkonen & Loikkanen, 2020); (2) the relationship between environmental concern and waste economy as it is reflected in newspaper articles and legislative discourse (Kinnunen et al., 2020); and (3) the City of Rovaniemi's pioneer project on circular economy based on a total of 8 interviews with the project's key actors

(Loikkanen, forthcoming). Here, we present a re-reading of our previous studies that place the bin—and by extension waste infrastructure—at the centre of interest.

In our previous studies, we have found that waste governance in the era of CE places a great deal of emphasis on guiding, targeting and controlling the citizen's waste practices. This tendency towards governance finds its focal point in the bin and the way it *should* be used as part of the everyday waste governance efforts of households. In this chapter, our particular focus will be on the bin and the waste work done with it as part of the broader waste infrastructure of CE. We restrict our examination to research on solid municipal waste governance and have intentionally omitted household wastewater infrastructure governance from discussion.

In the next section, we take a brief look at the history of modern (read: Western) waste infrastructure and ask what kind of infrastructural change CE is producing. We continue by presenting our theoretical approach to exploring waste infrastructure, where both the citizen and the bin are seen as key agents. In the three sections that follow, we present our analysis of infrastructural change, particularly concentrating on the role of citizens and bins in it. Finally, we conclude the paper and highlight how the function and transformation of CE waste infrastructure produce *waste citizenship*.

## WASTE INFRASTRUCTURE AND ITS TRANSFORMATION THROUGH CE

In the Western world, the infrastructure built for managing household solid waste has long been a rather linear system with a primary emphasis on waste logistics (Offenhuber, 2017). Its basic structure has been formed by waste containers of households, waste collection and transportation arrangements, and the methods for end treatment and further treatment of waste—which in the West has until the mid-1990s generally meant landfill disposal (Corvellec & Hultman, 2012). This kind of waste infrastructure, which is centred around the idea of disposing of waste, has been viewed as a functional solution, both from the perspective of implementation of the objectives of Western waste governance and policy as well as from that of the citizen's everyday waste practices. It has enabled attainment of the general goals of waste management in that it has effectively removed the material surplus generated by consumption, thus maintaining general hygiene and the cleanliness of the environment,

while also ensuring that the presence of waste does not interfere with the consumption-driven lifestyle which produces immense quantities of material surplus (Gregson & Crewe, 2003; Hawkins, 2006).

Thus, the waste infrastructure based on the idea of waste disposal can be characterized as an established, institutionalized system which functions in the background of everyday life and remains practically invisible as long as bins are emptied on schedule. In this system, the citizen is ascribed an active—although narrow—role as part of the functioning of the linear waste infrastructure. The task of the citizen has merely been to place waste generated by the household into the bin, after which the waste has become the concern and responsibility of the public waste management system. According to political geographer Kersty Hobson (2016), the role of the citizen in a linear economy is comparable to that of the consumer—an individual who consciously makes rational consumption choices and sorts their waste according to the instructions.

Effective removal of waste generated through consumption has been one of the common goals of waste management. However, at the latest since the early 1990s, this view has been the subject of increasing criticism. Growing quantities of waste and scarcening natural resources together with rising environmental awareness have revealed the nature of the relationship between waste and the environment: Waste governance has never been about disposing of materials—it has been about moving them to a different location. It is this insight that transformed our understanding of waste as well as the ways of governing it. Waste was no longer seen as a purely technological question, but attention started to shift to waste itself and the practices that are producing it (Corvellec & Hultman, 2012; Hawkins, 2006.)

In the beginning of the 1990s, the EU set waste management as a key question of its environmental policies, to which the member countries are required to attend in their national waste policies. CE has, at least in the EU, become politically the most important proposed solution to the environmental crisis, climate change, pollution and the loss of biodiversity. The idea has been developed decades earlier in the field of industrial ecology, but at present it is being produced as a political programme in international politics, marketing and development plans of industry and corporations as well as in national sustainability programmes (Hobson, 2021; Johansson & Henriksson, 2020; Korhonen et al., 2017). Long-term objective of the EU's waste policy is to transform the EU into a recycling society, in which the amount of waste is minimized and waste

that has already been produced is reused. To guide waste management, a five-level waste hierarchy was created (European Commission, 2008), in which the primary objective is to prevent waste, and if that is not possible, waste should be prepared for re-use or recycled. If recycling is not an option, waste has to be utilized, more preferably as material than energy. End treatment, as in landfilling, is only accepted if utilization of waste is not technically possible or useful (European Commission, 2019). The aim is to dismantle the connection between economic growth, increasing use of natural resources and waste production as well as to acknowledge the life-cycle impacts in all of the decision-making in waste management.

Although CE as a concept has multiple meanings—for instance, Kirchherr et al. (2017) distinguished 114 meanings in their review—and it is used to refer to much more than simply waste governance (Korhonen et al., 2017), adopting the concept in practice has brought about waste infrastructural change (Hultman & Corvellec, 2012). Guided by EU's circular economy policy, the EU member states have changed their former waste infrastructures operating on the principle of removal of waste and initiated a shift towards a system based on circulation of materials according to the principle of circular economy. In Finland, for example, the transition has been gradual: From the 1990s onwards, Finnish waste legislation has undergone a series of reforms to enable a shift of focus from governance of waste already generated to methods that prevent waste generation. Among the key measures have been legislative and administrative steering, various economic steering mechanisms, and redefinition of responsibilities and obligations. Finland's 2016 Waste Act reform implemented a ban on landfilling waste, introduced the citizen's obligation to sort and recycle waste and made a detailed classification of waste in which the status of objects and things as waste is determined by the materials they are made of (e.g. glass, metal, cardboard, organic matter) and the method of processing the materials (e.g. combustible, recyclable, reusable).

The citizen's position in the waste infrastructure of CE is entirely different from that the citizen occupied in the infrastructure based on waste removal. CE is transforming waste management through intervening in the ways in which we live with our waste while simultaneously modifying the infrastructure designed for disposal. When previously waste was transported away from cities to be managed in the outskirts of residential areas, developments in recycling and valorization of especially municipal solid waste have visibly brought it back as part of our daily

activities. In other words, waste is not visible anymore only in “sad places,” the unprivileged areas, but instead, we sort out, recycle and manage waste everywhere (Valkonen et al., 2019). This development has brought bins, as well as the citizens using them, to the forefront of society. Therefore, in the next section, we examine the bin as a tool of mundane governance in order to understand these transformations within waste infrastructure.

### MUNDANE GOVERNANCE WITH THE BIN

Kathryn Furlong (2014) reflects on the ideal of the modern infrastructure critically and argues that our understanding of infrastructural change is based on the idea of replacing one system with another. According to her, this view of infrastructural change is based on the general assumption that Western infrastructures are universal and uniform networks of technology functioning as an “unconscious backdrop to everyday life,” and against which all infrastructural arrangements should be examined. If we take sociotechnical transitions in the South as an example, Furlong suggests that we tend to assume that Western infrastructure is “the end point, i.e. one system is replaced by another.” Viewed in this way, infrastructure appears as “stabilized,” “obdurate” and “black-boxed,” that is, as “essentially immune to change or external influence” and “transition from one system to another is possible but rare” (Furlong, 2014, p. 140). Such an understanding of infrastructural change tends to promote an image of change as challenging, although not impossible. Instead of viewing infrastructural change as an extensive systemic change which would reconfigure functions of society, Furlong (2014, p. 144) maintains that when examining infrastructural change, we should also consider its gradual transformation into something new. In addition, when implementing infrastructural change, attention should be paid to the differences of established Western infrastructures. For example, water and energy distribution infrastructures are different from, say, communications or transport infrastructures both in terms of their function and use (see, e.g., Pink et al., in this volume; Vannini & Vannini, in this volume). Due to the differences between infrastructures, the process of changing them involves challenges and requires particular kinds of investments and practices.

In their research on mundane governance, in which they analysed waste governance in the context of Great Britain, Woolgar and Neyland (2013)

have found that socio-political governance measures are typically targeted at seemingly minor everyday objects, things and technologies and, in particular, concerned with “whom or what is accountable to whom (or what)” (Woolgar & Neyland, 2013, pp. 1–2). According to them, this has been the case with waste governance. Woolgar and Neyland show that a change in emphasis of environmental policy brings about change in waste policy, and, consequently, the ontological status of waste is transformed and practices related to waste become subject to negotiation. Woolgar and Neyland point out that a set of classifications is a central mechanism in British waste policy. These classifications are a significant part of governance and they are being maintained and strengthened through everyday objects and technologies. By using classifications, categories, numerous subcategories as well as their internal subdivisions, waste policy ensures that particular waste objects end up in their designated locations or that they will be used in a particular way (see also Woolgar & Lezaun, 2013, pp. 327–333).

According to Woolgar and Neyland, waste classifications are controlled at the regional level, but governance is usually part of a broader waste governance system at the national level. For example, in Great Britain, a target has been set for all waste to be recycled, and progress towards achievement of the target is monitored at the national level. Local authorities are responsible for the implementation, i.e. for ensuring that the quantity of waste to be recycled increases. Local authorities delegate responsibility to households, which are then required to perform a number of tasks related to sorting waste into the right categories. These measures include, for example, sorting waste into the appropriate recycling containers, as well as preparing materials for recycling, e.g. cleaning glass jars and metal cans to be recycled before placing them into the containers (Woolgar & Neyland, 2013, p. 77). The waste classification system is also maintained through communications, for example, distribution of information to citizens and households, or installation of signage with instructions on what to do and how to use specific facilities, including what not to put in the recycling containers. Adherence to the classification system is monitored, and failure to adhere to the classification system may result in sanctions.

The analysis by Woolgar and Neyland illustrates that infrastructural change steered by waste policy does not take place through replacing one system with another. Instead, change is implemented as an effort to govern that is concretized in the most mundane everyday practices

formed by networks of people, things and meanings. Governance consists of efforts to steer everyday practices—such as the way in which bins should be filled—through familiar technologies and objects. At the level of the system as a whole, a number of everyday technologies and objects—such as recycling containers, transportation vehicles, signs on the recycling containers, and recycling centres—are needed. Governance is also essentially linked with control and sanctions for non-compliance (Woolgar & Neyland, 2013, pp. 77–78).

Although conducted in the context of Great Britain, Woolgar and Neyland's analysis on waste governance can be viewed as descriptive of EU waste governance policies in the era of circular economy more generally. For example, waste governance in Finland and Sweden is, for the most part, realized in a similar way (Kinnunen et al., 2020). The aim of EU circular economy policy has been to change the waste infrastructure in a way that supports attainment of CE objectives. The change has not meant replacing the national waste infrastructures of the EU member countries with new ones, but, rather, change has been implemented gradually as a reconfiguration of the waste infrastructure. This reorganization has been implemented by changing the role and function of the bin as part of the broader solid municipal waste infrastructure. The bin is the focal point of waste governance: Instructions on its use are being provided, and its use is being regulated (Kinnunen et al., 2020; Woolgar & Neyland, 2013). Proliferation of bins and change in the function of the bin are, indeed, among the concrete manifestations of circular economy in the broader context of the solid waste infrastructure. Following Woolgar and Neyland's notion of mundane governance, we view the bin as a key technology that the governance efforts of circular economy are focused on, with the objective of transforming the existing waste infrastructure. Different waste classifications, categories and subcategories become concretized in the bin, enabling detailed measurement, comparison and control of waste flows, and the bin guides the citizen's everyday waste practices towards a particular direction (Offenhuber, 2017). In other words, the citizen's acts of using the bin for its designated purpose simultaneously represent a contribution towards waste infrastructural change in circular economy.

Studies on the role of the bin as part of waste infrastructure and its change in a broader sense have been scarce, although the position of the bin in waste governance has been acknowledged. The bin has been conceptualized as a mediator of waste practices (Chappels & Shove,

1999), as a policy instrument (Bulkeley & Gregson, 2009) and as an object that can be ascribed agency (Metcalf et al., 2012). In addition, the bin has been perceived as a link between household waste practices and waste governance, and it has served as a point through which responsibilities and obligations have been assigned to different actors as part of the larger waste management infrastructure (Peltola & Åkerman, 2012; Woolgar & Lezaun, 2013). We propose that instead of examining the bin in terms of its individual aspects, we should view it as a key agent of waste infrastructures. This view enables examining the function, use and nature of the bin in more depth than has been done previously. The bin cannot be reduced to an object or a link between private and public waste management: It is an intersection of the waste infrastructural network and, indeed, a prerequisite for the functioning of such a network.

In our analysis of the bin, we rely on the theory of mundane governance (Woolgar & Neyland, 2013), according to which categories, instructions, classifications and governance measures concerning waste constitute reality. In other words, they transform the ontological status of waste. Against this theoretical backdrop, we adopt the view that the bin concretizes circular economy's governance efforts towards waste infrastructural change. We draw from the notion introduced by Metcalf et al. (2012), according to which the bin can be ascribed three-fold agency consisting of symbolic, relational and material aspects. According to this view, first, the bin has agency relationally being "one aspect of a broad waste infrastructure without which it would not exist as a conduit of unwanted materials" (Metcalf et al., 2012, pp. 5–6). Second, the bin symbolically "represents waste and the environment on the one hand, and cultural cleanliness, order and pollution on the other." Third, the bin has material agency because it has "capacities and affordances and as such affects waste practices." A central question then is: How are the bin's representational, infrastructural and material qualities interweaved? The particular focus of the study conducted by Metcalf and his colleagues was on food bins in households, but they encourage adopting bins in general as an object of empirical research and urge us to ask how the bin enacts its role of integrating households into the broader waste infrastructure and its transformation. Here, we will look at the agency of the bin in all its aspects—relational, symbolic and material—and argue that this approach allows us to understand the position of the citizen as part of CE waste infrastructures.

### RELATIONAL AGENCY OF THE BIN

The bin is an everyday tool of waste management and children learn to use it early on. In many homes, there are bins in different rooms, and the bin can be characterized in terms of its constant readiness to perform its simple task of contributing towards removal of waste from the domain of the home. As Metcalfe et al. (2012, pp. 5–6) have stated, the bin also occupies a central place in the waste infrastructure as a whole. Viewed from this perspective, the agency of the bin is *relational* in that the bin functions as a link between public and private waste governance. A number of responsibilities, obligations, rights and choices are crystallized in the bin, and these form relations between different agents such as public waste management and individual citizens. Thus, the bin functions as a relational object which mediates material and ownership relations as well as distribution of responsibilities and obligations.

A central argument in research on infrastructures is that infrastructures become visible when their functioning is interrupted (Star, 1999). This also applies to the bin. Attention is often drawn to the function of the bin as part of waste infrastructure in situations in which operational models have not been fully established or the flow of everyday life is disrupted for one reason or another. For example, relocation is a process where the citizen is faced with the necessity of reflecting on their relationship with things and their practices of keeping and discarding them.

Sociologist Veera Kinnunen has examined the process of relocation, or moving house, as a disruption of our everyday relationship with things—a gap in accommodation. (Kinnunen, 2014). Moving house always comes with the necessity of divesting oneself of something previously owned, because it practically always involves leaving something behind. Thus, when moving, a person must decide what to keep and what to let go of (Kinnunen, 2017, p. 106). The citizens who participated in Kinnunen’s study classified their things into three initial categories during the moving process: (1) things they want to continue to live with; (2) things they want to divest themselves of that are reusable and can find a new life elsewhere; and (3) things that will be placed in recycling bins and continue their route to recycling or combustion facilities. The first category included things that had practical or emotional value, as well as ones that ensured continuity of everyday life and were relevant to personal memories and narratives. The middle category included things that were no longer

meaningful to the owner as well as ones that were “unbearably meaningful” but no longer wanted. In the third category were things that were no longer usable, characterized as “ugly and broken things” (Kinnunen, 2017, p. 116). Among them were, for example, broken household appliances, worn-out mattresses, and broken shoes and other objects. When the point is reached that the owner cannot think of where to relocate the things, they cease to be individual objects and become surplus material that is measured by the sackload or by the landfill load.

When examining the process of moving closely as Kinnunen has done, we become aware of the diversity of the practices of divestment and the multiple meanings attached to them. The citizens who participated in Kinnunen’s study had seven different practices of divesting themselves of excess items that fall into the middle category—ones that were no longer needed or wanted: donating, selling, handing them over to the waste management system, storing, destroying, transforming them into something else and freeing. These practices, in turn, were connected to a total of 45 different conduits through which the items that were no longer wanted were removed from homes during the process of moving. These conduits included donating items to relatives and acquaintances, museums, libraries, recycling points at the workplace, or donation groups operating on social media platforms, selling items at flea markets, online marketplaces or auctions, storing them in storage spaces or at summer cottages and putting them in a dumpster, taking them to waste recycling points or landfills (Kinnunen, 2017, p. 89).

While one may assume that when a thing is no longer wanted, throwing it away would be easy, Kinnunen’s study has—perhaps rather surprisingly—proved otherwise. According to Kinnunen, discarding things that are no longer wanted but can be reused requires of the citizen “effort, knowledge, tools, networks, transportation, photographing, making phone calls, borrowing means of transportation, and even driving hundreds of kilometres” (Kinnunen, 2017, p. 88). And what is more, only two of the practices of divesting—handing things over to the waste management system, and destroying—use channels that lead to transformation of the things into waste (Kinnunen, 2017, pp. 88–89). Thus, instead of simply removing unwanted things from the home, citizens seem to use almost any means available to avoid having to put the things in the bin: “sometimes throwing things into the bin seemed like an act of violence” (Kinnunen, 2017, p. 191).

Two interrelated things about the nature of the bin can be inferred from the above. First, citizens may produce waste by removing materials that are no longer needed or wanted from the domain of the home. However, within a household, the nature of things and objects to be removed or kept is in many ways open-ended. Their status as waste is dependent on the practices where things become defined as objects or materials (Gregson et al., 2007). The bin constitutes an interface for the citizen's waste practices: It is only when things are placed in the bin that they become waste. The bin thus has an agentive role in transforming unwanted things into waste.

Second, the citizen's efforts towards management of material surplus are steered by the objective of CE: Avoiding the need to assign objects and materials the status of waste. The citizen's aspiration to let go of unwanted things in the "right" way and to avoid their becoming waste is indicative of the fact that, in our culture, which is based on "large-scale production and equally large-scale divesting," the act of "divesting oneself of things is marked by concern" (Kinnunen, 2017, p. 192). When citizens are using virtually all means available to prevent things from becoming waste, in practice they testify to the normative nature of the bin as a factor regulating both discarding and keeping things. We cannot, as if unproblematically, think about the bin as a location outside the home in which we can place our unwanted things. Rather, the bin is internal to the citizen's waste practices—and, at the same time, something that lies outside, at an intersection between the home and the world outside it. The bin is a norm, and the practices of discarding and keeping things are indicative of its normative nature (Gregson et al., 2007, p. 197).

The objective of CE policy is to transform waste infrastructure in such a way that waste materials generated by households will continue to circulate in the material flows of society. This change does not necessarily mean a total transformation of the waste infrastructure, as has been shown in Kinnunen's abovementioned study on the citizen's work with things during the process of moving house. The function of the bin as a tool that citizens use when discarding material excess seems to remain unchanged, although the role of the bin as part of the waste infrastructure as a whole would be changing. Thus, what is relevant from the perspective of attainment of CE objectives is the way in which citizens are using the bin.

In the context of CE waste governance in Finland, responsibilities and obligations are distributed among actors in such a way that appropriate

handling of waste generated by households is the citizen's responsibility, whereas transportation and further processing of waste materials are the municipality's responsibility. However, the division of responsibilities among actors in CE waste infrastructures is not clear-cut. Our study on realization of regional waste policy and governance in Finnish Lapland showed that municipal waste actors understand the responsibility of households as considerably more extensive. They described regional waste governance as a system of interdependence, in which all the actors are significant.

It is the (municipality's) responsibility to receive (waste) here and to develop further treatment to them. [...] But, of course, accountable are also the waste transporting companies that collect the waste in sites it is produced, accountable are of course the people who generate it, as in all of us.

Municipal waste actors stress the responsibility of all stakeholders for the functioning of the waste management system, however, they return the final duty to citizens. Municipal waste management official states that CE pursued by waste management is possible only if citizens sort out their waste and place it in the appropriate place:

Even though [the municipality] has the responsibility where waste ends up through us, still I will hold the generator of waste, the citizen, responsible here in how this issue is handled.

Thus, the role of the citizen cannot be regarded as that of a mere user of the system responsible for the appropriate sorting and recycling of waste. Instead, the citizen's role is seen as paramount to the functioning of the system. Municipal waste items are located and used in private homes, and thus, they exit only when citizens sort them out and dispose of them as waste. Against this backdrop, public waste management cannot be dismissive of the way citizens sort and remove waste generated by households. Rather it can be argued that, in order to function, CE is entirely dependent on individuals' abilities and willingness to use the bin as it should be used, and their effort to do infrastructural work. Municipal actors are making efforts to influence citizens' everyday waste practices through various ways, by using information steering as well as economic steering mechanisms, e.g. waste fees, and by installing waste collection points that

offer even more detailed waste material categories—in practice different kinds of waste containers. Thus, it is waste containers that effectively steer citizens' waste practices and enable and maintain more effective circulation of waste materials. In this way, the relational agency of the bin is enacted at the waste infrastructural level, which allows for mediating new, desired waste management practices to citizens.

As a relational object, the bin brings together activities of private citizens and those of public waste management, thus defining ownership of waste. The bin also functions as a significant interface between the useful and the useless or the necessary and the unnecessary. Once placed in a bin, an item gets defined as waste and, after this point, it will no longer be available for use to the actor who discarded it. The primary objective of CE is to continue to ascribe to things a status other than that of waste by creating a number of new categories of continued use. Thus, things to be discarded do not simply become waste, but materials—such as glass, metal, plastic and cardboard—to be reused. Collection containers for each of these materials have to be provided, and the containers integrate households into the broader waste infrastructure. Waste containers are also interrelated and form a network in which materials are, for example, arranged in order of importance regarding recycling. Placement, colour and in particular size of containers encourage different ways of using the bin. A large container conveys the impression of a large quantity of waste generated. This is an issue worth addressing in the context of implementation of waste governance when the objective is to encourage people to enact a certain kind of citizenship.

### SYMBOLIC AGENCY OF THE BIN

In their study on food waste collection, Metcalfe et al. (2012, pp. 11–13) have found that a bin within the home is stigmatized as unclean or unsettling. Once surplus is placed in the bin, it immediately turns to something objectionable and unclean—characteristics also associated with the bin itself. If the kitchen is to symbolize cleanliness and care, the bin does not seem to fit in the picture as a visible part of the kitchen. Then again, the bin represents order and environmental goals as well as the individual's responsibility as a participant. Through its symbolic agency, the bin contributes to building pairs of opposites, such as cleanliness and uncleanliness, order and chaos, right and obligation. In this way, the bin and its appropriate use are connected with maintaining the symbolic, moral order

of waste society. In this section, we examine the ways in which the bin as an object enacts its symbolic agency.

According to Woolgar and Neyland, policy should not be thought of as a separate something surrounding objects, but rather, the nature of things and objects should be seen as quintessentially tied to policy in that policy measures embody the nature of things and objects. Woolgar and Neyland maintain that the challenge is to understand the workings of policy at the level of ontology and the ways in which a particular object stands for particular policy measures, thus becoming governance (Woolgar & Neyland, 2013, p. 14). They also point out that changes to governance practices frequently spark discussion on how our lives are being regulated and steered (Woolgar & Neyland, 2013, p. 2).

When examining waste governance in CE, we will notice that discussion on CE is in many ways intertwined with the bin—what it is, what it is for, and whose responsibility it is. It is not only a question of the bin being a superior instrument of collecting various waste materials in the context of waste governance in CE. In addition to being a material technology, which makes the citizen's life more comfortable, hygienic and clean (Peltola & Åkerman, 2012, p. 52), the bin also creates symbolic order in community life through contrast between the clean and the unhygienic, the orderly and the disorderly. What is crucial from the perspective of effective waste governance is how well the bin is able to maintain—in concrete terms—the prevailing moral order of waste.

The moral order intertwined with the bin is partly based on its function that is so mundane that it is taken as a given. Every rational and normal person knows what a bin is and what it is for. The entirely ordinary, everyday nature of the bin marks and strengthens the contrast between what is conceived of as “irrational” and “normal” action (Woolgar & Neyland, 2013, p. 51). The moral order embodied by the bin often becomes visible when waste management processes are interrupted for one reason or another.

During Christmas of 2017, *Helsingin sanomat*—the newspaper with the widest circulation in the Nordic countries—published a piece announcing that “recycling points have turned to dismal scrap heaps, trash is being thrown all over the place, even into the bushes.” According to the news piece, “in many places, during the week before Christmas, and particularly during Christmas, recycling points have been filled to the limit of their capacity, or the limit has been exceeded.” A person interviewed by the newspaper described the sight as “depressing.” The news

article exemplifies how thoroughly established, ordinary and self-evident waste governance practice the bin is. As long as the waste first placed in the appropriate bins at homes finds its way to the appropriate containers outside the homes, and further, moves along the appropriate conduits to the processing facilities, the everyday practicality of the bin maintains its established status. However, as soon as the bin fails to perform its function, the contrast between “the depressing sights of dismal scrap heaps” and the practices perceived as normal becomes visible, thus also revealing the prevailing moral order regulating what the bin is, what it is for, and how we should interact with it (Woolgar & Neyland, 2013, pp. 7–9, 51). In other words, the wrong way of using the bin evokes resentment, which reveals the moral order connected to bins. This means that the moral order of waste—that which is good, right and worth pursuing—has been inscribed to the bin (Hawkins, 2006).

What is interesting about the news article referred to above is the fact that, although the waste containers were probably filled to the limit of their capacity for reasons traceable to the inadequate capacity of the waste management system, the citizens interviewed for the news piece did not criticize municipal waste management. Instead, in an attempt to find a “culprit,” their attention turns to other users of the recycling point—fellow citizens. Waste in the wrong place is, thus, interpreted as failure of the users of the bin to use it appropriately, which, again, reveals that the bin indeed maintains moral order of waste. As Mary Douglas has famously argued, dirt is matter in a wrong place. In a similar way, inappropriate placement of waste violates the prevailing order of waste society. “The depressing sights of dismal scrap heaps” are indicative of failure to maintain social order. The news example indicates that the moral order of waste as it is embodied in the bin transfers the responsibility to act within the waste infrastructure and to control and monitor its functioning to the citizens using it.

The news example shows that citizens using bins are not only “recipients of services but co-producers, whose behaviour is vital for managing shortages” (Furlong, 2014, p. 142). As Furlong argues: “they play active role in absorbing, coordinating, and even orchestrating disruption.” In addition, user reactions to system function and breakdowns are defined by perceptions of what is normal or aberrant for the infrastructural system in question. The news example also enables a reading that, in Finland, interruptions in the functioning of waste infrastructure do not necessarily undermine the users’ trust in the system. This shows how

gaps and disturbances are ordinary experiences for the users of modern waste infrastructures. Studies have shown that this is typically the case in Western countries. Trentmann (2009) as well as Graham and Thrift (2007) have illustrated that users of infrastructures acknowledge their occasional breakdowns but also them being temporal: they “are not freak accidents of aberrations but normal, constitutive features of lived normality” (Trentmann, 2009, p. 69). When disturbance is over, the mundane lives of people carry on as before.

With regard to the attainment of waste governance objectives, the bin is an effective governance tool because, in its capacity as a material object, it effectively enacts the moral order of waste. Waste materials that are inappropriately placed are concrete proof of the waste society’s failure to function the way it is expected to function. This in turn—as the news example also indicates—sparks debate about how we should act and live with waste and, in the end, whose responsibility it is. Therefore, citizens, the users of waste infrastructure, are not “faceless automata following iron rules, institutions or given roles/functions” (Geels, 2005, p. 12), but instead co-producers, actors who make the functionality of waste infrastructure possible.

As has been pointed out above, the bin as a symbolic object no longer stands for mere discarding, or removal, but it makes citizens reflect on their individual choices and their wider significance as part of the collective moral spine of waste society. As Metcalfe et al. (2012) have argued, the symbolic agency of the bin also becomes visible in the fact that, despite its objectionable quality—or perhaps even because of it—the bin activates citizens to think about their own role in waste governance, for example, to reflect on what activities are right and whether they are everyone’s responsibility. According to our interpretation, citizens see themselves as responsible to waste governance through their recycling efforts, choices and infrastructural work; and to other citizens as part of collective efforts. If somebody is using the bin in the “wrong” way, it generally appears as outrageous and can be interpreted as an ethical violation against other citizens. Waste infrastructure is perceived as a common ground of shared moral responsibility.

### MATERIAL AGENCY OF THE BIN

According to Metcalfe et al. (2012), the material agency of the bin is the most evident of the three aspects of its agency. The bin as a physical—and

often new—household object won't go unnoticed. The size, colour and placement of the bin, as well as the number of bins in a household, are part of the material agency of the bin. These characteristics of bins enable different waste practices, but first and foremost, they encourage citizens to act differently. In this section, we elaborate on Metcalfe et al.'s (2012) view of the material agency of the bin. In the era of circular economy, one key manifestation of the material agency of the bin is its ability to transform various discarded objects and packaging into materials that are framed as valuable resources in a society based on CE. The material agency of the bin is used as a means of steering citizens by emphasizing the bin's ability to make the useless useful again.

Prior to CE, waste was largely viewed as a concern of waste management. The question of the value of a material or an object was a central criterion in defining what counts as waste. Waste was associated with something discarded, abandoned, removed and as such worthless or devoid of value. This thematic of discarding and throwing away is also evident in Finland's former Waste Act (1072/1993), according to which waste means "any substance or object which the holder discards or intends, or is required, to discard." Thus, any material or object that falls within the scope of this definition is "waste" and as such belongs to the domain of waste management.

CE policy is making conscious efforts to make a transition away from the idea of waste as something discarded, abandoned or removed—and devoid of value. For example, a recurring remark in CE discourse in Finland is that there is no such thing as waste, and all we have is resources: "Someone's waste is another one's treasure." Recycling is viewed as a central mechanism of *undoing* the status of waste as waste while also changing the negative economic value of material into positive value. Recycling is an act of returning a material or an object into use or into the market. The fact that this kind of returning is possible indicates that that which returns has never really disappeared, but rather, its cultural status has changed. An object or a material has become waste through the act of discarding, throwing away or removing, which has also framed it as worthless or devoid of value. From the perspective of recycling, waste is positioned in a new way that begins to deconstruct the opposition "valuable vs. worthless" by drawing our attention to the fact that the "value" or "worthlessness" of objects or materials is not based on their physical characteristics. As Hervé Corvellec and Johan Hultman (2012) have pointed

out in their research on Swedish waste policy, there is no object that would *in itself* be waste, because waste per se does not exist.

Corvellec and Hultman emphasize that waste and the entity dealing with it mutually determine each other. Once a material or an object is placed in the category of waste, it will be treated as waste. Being defined as waste is directly connected with the existing waste practices, which in turn, in concrete terms, make materials or objects physically waste—or something else. What counts as waste at any given time is, thus, embodied in the practices concerning waste. As stressed by Corvellec and Hultman (2012, pp. 2013–2014), waste is not an unchangeable starting point of waste governance but subject to social reframing and the resulting waste practices consistent with it.

The change in organization of waste management called for by CE policy has required transformation of the concept of waste, which in practice has meant a reform of waste practices. Changing the ontological status of materials and objects formerly thought of as waste has been necessary, because it is not possible to ultimately get rid of waste, whatever our aspirations may be (Strathern, 1999, p. 61). This being the case, waste has to be transformed into something else (see Woolgar & Neyland, 2013, p. 59). The bin has a central role in this process. If the concept of waste previously brought to mind all the places and processes—landfills, surplus soil disposal sites, waste management services and waste-to-energy plants—intended for materials and objects that must be discarded and disposed of as “worthless,” now CE presents itself to us as countless bins, waste sorting points and recycling parks. Paper, cardboard, glass, metal, plastic, biowaste, waste electrical and electronic equipment (WEEE), textiles and waste-to-energy are collected in separate containers.

When the citizen places the sorted waste materials into the appropriate bins, the status of the materials changes from “to be discarded” to something else—recyclable plastic packaging, combustible energy waste, recycled textiles and so on. The bin thus transforms, in practice, waste discarded by households into raw materials for CE. Simultaneously, an economic transition takes place: The negative value of waste changes to a positive value of materials. In Finland, a price has been assigned to processing of each waste material: Placing waste materials in the appropriate bins is subject to a household waste fee, and separate fees apply to unsorted waste and hazardous waste. When every waste material has

its price depending on how time-consuming, dangerous or desirable the processing is, waste can no longer be without value.

In order to achieve a transformation of the ontological status of waste also in citizens' minds, information steering is a central measure used in waste governance in Finland (Valkonen & Loikkanen, 2020). The material agency of the bin is crucial regarding the success of information steering because the bin is the locus where the significance of appropriate sorting becomes concretized. The regional waste actors of Lapland emphasized that the waste generated in households is not waste, but materials that have economic value. Information steering in waste management can be thought of as a civic education project where education, communications, instructions and economic steering are aimed at encouraging citizens to embrace an agentive role as actors in CE. In this case, too, governance efforts are made through the bin.

By exercising information steering, waste governance has sought to change the notion of the bin as a tool for throwing away waste. In its communications, the regional waste management frames the bin as a tool of collection which is used to collect waste materials generated and sorted by households. Once a sorted waste material is placed in the appropriate bin, it turns from waste to a resource. In this process, the citizen's role is entirely different from what it would be, were the bin considered as a tool of throwing away waste. By sorting and recycling waste the citizen practices circular economy, i.e. engages in infrastructural work without which resources in circular economy cannot be collected. In CE, different kinds of bins do not only stand for different types of waste but also represent resources in the economy. For example, a metal collection bin produces metals that compete in the market with virgin materials.

A recurring concern expressed in CE discourse is how materials flows in society can be made more effective and maximized. In Finland, household waste fees are based on the number of emptyings of the bin and the volume of the bin. Although the system can be generally viewed as rather effective, other models have been tested as well. For example, a waste management company operating in the City of Rovaniemi has introduced a service where waste fees for combustible mixed waste and biowaste are based on weight. This kind of system functions as an incentive for citizens to sort their waste more effectively, because the waste fee is based on weight instead of volume of the container. In such a system, the users pay only for the unsorted mixed waste and biowaste generated. This is an

example of economic steering, the purpose of which is to encourage citizens to change their sorting behaviour: If mixed waste is subject to high fees, people will be more likely to sort their waste. Waste which is sorted according to material categories is subject to lower fees. This thinking is based on the idea that information steering alone is not sufficient, and economic rationality is believed to steer citizens more effectively towards the desired goals. A waste logistics entrepreneur describes the situation.

Well, the current situation is such that, because waste fees are based on weight, it makes no difference if there is one bag or ten. The fee is always the same. So, now there is, now there is a weight-based collection fee. There is a fee for emptying the container. So, now they pay for what they generate.

The customer will see from the invoice how much [waste] they have generated. And we will provide annual reports to those who request them.

With this model, too, the material agency of the bin is based on the bin's ability to transform discarded materials into resources for CE. Different bins represent different economic resources, and with weight-based measurement, the option of using the bin in an economically rational way is intended to steer citizens to change their sorting behaviour and sort their waste even more carefully than before. This is viewed as an advantage also to the user of the bin—the citizen—in that individual households will only pay for the waste they generate and the users of the bin can, thus, influence the waste fees through their choices. In this case, too, waste governance is implemented by shaping the bin as a tool the citizen can interact with to make better choices. The material agency of the bin is thus believed to bring about the desired change across the entire waste infrastructure through steering citizens' actions.

In the context of the material agency of the bin, Metcalfé et al. (2012, pp. 10–12) emphasize the opposition faced by food bins: They are perceived as a source of unpleasant odours, they are also visually unpleasant, they take up space and have to be emptied. From the perspective of change, it is interesting that both feelings of unpleasantness and disgust and a sense of responsibility seem to lead to new household waste practices. Despite or perhaps because of this, they make people reflect on their relationship with waste and change their behaviour. Also, one of our interviewees, a representative of a waste management company, noted that the space taken up by the many different bins for different materials

in a household represents a significant challenge. While CE has brought a whole range of bins on sides of streets, intersections and residential areas, bins have also been brought to homes. Our data represents a small city in Finnish Lapland, but if we are looking at the EU as a whole, such problems related to limited space for bins are considerably more significant at central locations of many large cities. Thus, the material agency of the bin also has a local dimension which has not been taken into consideration so far in the EUs CE plans.

In an attempt to understand the change in waste infrastructure brought about by CE, we expanded the idea of the material agency of the bin to encompass also its ability to make waste valuable again. A central goal of CE is to make waste a resource. Referring to waste as a resource shifts emphasis from material surplus as a problem and, instead, emphasizes its economic usability. In order to be transformed into a resource, waste must undergo sorting and recycling by citizens as part of CE activities. Once citizens have, through successful information and economic steering, adopted the desired sorting practices of placing waste materials in the appropriate bins, the bins can be governed as individual economic goods. However, it must be borne in mind that recycled materials cannot always compete with virgin resources. Similarly, it has been noted that economic incentives as a steering mechanism for waste practices are not always as effective as might have been expected (Cecere et al., 2014, p. 172; Johansson & Corvellec, 2018, p. 323). Thus, various responsibilities, obligations, modes of acting, instructions, as well as logistic and economic practices, have to be ascribed to the bin in order to be able to transform the materials into competitive resources in the market.

Here, too, the citizen's role is central: In order to be able to transform worthless waste into valuable resources, citizens are required to engage in infrastructural work that plays a quintessential role in the resource production of the materials economy in CE.

## CONCLUSION

In this chapter, we have examined what kind of infrastructural agency the current waste governance in CE presupposes and requires of the citizen. This chapter opened with the question: How does the agency of "the bin" shape citizenship in CE? Our analysis centred on the bin, in particular different waste collection containers, in which the detailed categorization of waste in CE is concretized. Our findings are in line with the notion put

forward by Metcalfe et al. (2012) that the bin is not only an object that enables various sorting practices. By virtue of its relational agency, the bin creates obligations that integrate citizens into the waste infrastructure of CE, thus highlighting the citizen's role as key part of the system. Through its symbolic agency, the bin links citizens to the moral order of waste society and presupposes an ethical engagement with waste. The material agency of the bin changes the spatial order of homes as well as society at large and transforms waste—formerly thought of as useless—into materials or energy that are vital to a society based on circular economy. This is achieved by steering citizens, both by means of information and economic rationality, towards awareness of the hidden nature of waste as a resource. In other words, in addition to the citizen's role as a rational consumer, a new set of obligations is brought in, and the citizen is expected to ethically engage with waste and production of resources for CE to a far greater extent than before.

Previous studies have shown that the citizen plays a central agentic role in waste infrastructure when the state fails to implement waste management, waste management experiences an interruption, or state waste management infrastructure is non-existent (Fredericks, 2018; McFarlane, 2019). Anthropologist AbdouMaliq Simone (2004, 2021) has pointed out that in the absence of established, centralized infrastructures, people are required to perform infrastructural work with their bodies. In the context of waste governance, this means, for example, collecting, sorting, recycling and selling waste generated by households—including responsibility for maintaining general cleanliness and hygiene of the environment, and appropriate processing of waste. In such cases, it can be stated that people *are* infrastructure. Although the concept of “people as infrastructure” has been originally developed to refer to the struggle of people in vulnerable positions in situations where there is no infrastructure in place or infrastructure has failed, we believe that the concept is also applicable to the context of the Western welfare state.

We argue that, in established Western waste infrastructures, the role of the citizen cannot be reduced to that of a mere user, but the citizen should be acknowledged as a significant actor doing infrastructural work. By dealing with and sorting waste generated through consumption and placing the materials in the appropriate bins, the citizen is performing everyday waste work—an effort without which the waste infrastructure would not function and the waste governance objectives would not be

achieved. The role of the citizen as part of waste infrastructure is emphasized because the attainment of the objectives of CE is largely dependent on the individual citizen's ability and willingness to actively perform everyday waste work. In other words, CE cannot achieve its objective of transforming waste infrastructure unless the citizen adopts an active role as part of the waste infrastructure and aligns their everyday waste practices with the waste infrastructural goals. The process of change has been gradual: The bin and the expectations inscribed on it have been shaped as part of waste infrastructure, i.e. waste infrastructural change has been achieved by changing the citizen's engagement with bins. In this sense, here too, we can think about citizens *as infrastructure*—or at least as a key part of it.

As Antina von Schnitzler (2008) has found in her study on the use of water metres in South African households, infrastructures do not only regulate, say, water use or sorting waste, but at the same time, they are strategies of governance, produce ethical rules, and thus produce a new kind of citizenship. Such citizenship, which is connected to everyday life rather than state, has been addressed extensively in the context of a seminal debate on environmental citizenship. For example, Andrew Dobson's (2003) notion of ecological citizenship emphasizes the citizen's ethical responsibility towards other citizens instead of the state to a greater extent than before. In addition, citizens' virtues and obligations, which have traditionally formed the core of citizenship, are placed above the rights. Mirja Vihersalo (2017) has examined climate citizenship in the European Union and has found that the weakness of climate citizenship—which is also oriented towards the domain of the home and consumption—is lack of a political dimension.

Our interpretation suggests that waste infrastructural change in CE is not only about making waste practices more effective, but about producing a new kind of citizenship that we refer to as waste citizenship (Valkonen & Loikkanen, 2020). The waste citizen is a responsible actor who maintains the moral order of waste society through engaging in everyday waste practices. Through appropriate use of bins, the waste citizen enables the transformation of useless waste into valuable resources for a society based on CE. Although thrifty and considerate consumption ranks among the waste citizen's virtues, the presuppositions underlying the waste citizen's position are more far-reaching than that. The waste citizen is quintessentially an ethical actor and a central part of the waste infrastructure as a whole. The waste infrastructure, into which waste

citizens are integrated, is a shared operational environment in which “wrong” actions are subject to moral disdain by other waste citizens.

So far, waste citizenship has not led to political activation of citizens or raised sufficient awareness of the main goal of the European Union’s waste hierarchy: reducing the quantity of waste generated. However, as a concept, waste citizenship provides a tool that enables us to understand the role of the citizen as a central part of the waste infrastructure of CE and, by extension, the world as a site where citizenship is enacted on platforms also other than the nation state.

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