5 Mission-oriented innovation in urban governance

Setting and solving problems in waste valorisation

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5.1 Introduction[1]

As an ever-greater part of the world's population is living in cities, dealing with urban waste is becoming an increasingly prominent challenge for local authorities (Frantzeskaki & Kabisch, 2016). In many places, local authorities are struggling to cope with growing amounts of waste annually, as cities grow and citizens' consumption rises (Hoornweg, Bhada-Tata & Kennedy, 2013). Local authorities that lack the organizational capabilities and physical infrastructure to deal effectively with urban waste are often faced with huge environmental, economic and social problems (Hodson & Marvin, 2010; Mourad, 2016). Nevertheless, investments in organisational capabilities and physical infrastructure come with challenges and problems of their own. These investments tend to create lock-ins (see Chapter 3), which make the waste treatment system inflexible and prevent further improvements (David, 1985; Geels, 2002). The local authorities that make these investments run the risk of becoming stuck with systems that are technologically outdated and adequate only to deal with yesterday's problems. To introduce new and smarter urban waste systems, local authorities need to challenge existing policies and institutions, technologies and business models (Uyarra & Gee, 2013; Weber & Rohracher, 2012).

It is a paradox that the same investments in organisational capabilities and physical infrastructure that local authorities make to deal with problems related to waste today might prevent them from coping with tomorrow's problems. In this chapter we want to explore this paradox by focusing on how the municipality of Oslo deals with organic waste. The municipality of Oslo has made massive investments in a physical infrastructure consisting of an optical sorting plant, a biogas facility and an incineration plant. These investments have created strong incentives for the municipality to improve the sustainability of its waste treatment system by building upon existing infrastructure; for instance, by constructing a district heating infrastructure to make use of excess heat from the incineration plant and establishing a bus fleet that runs on biogas to make use of biofuels from the biogas plant. Nevertheless, the same investments also rely upon steady flows of organic waste and provide little incentives for the municipality to pursue more sustainable options for organic waste, such as reuse or prevention of food waste.

This paradox can be expressed as a dual challenge of operating in a problem-solving mode on the one hand, and of (re)defining the problems to be solved in the first place. It then becomes relevant to reflect on whether the actors who are tasked with the job of addressing and solving the challenges at hand are also the ones to decide the direction for change. This aspect has also been highlighted in the literature on mission-oriented innovation, emphasising the need for a better understanding of how the public sector can generate dynamic capabilities for addressing mission-oriented innovation (Kattel & Mazzucato, 2018), and in particular discussing who should take part in the identification and articulation of missions:

> Who decides the mission is a key issue that requires more thought.
> (Mazzucato, 2017, p. 10)

> Understanding more democratic processes through which missions are defined and targeted is tied to rethinking the notion of public value.
> (Mazzucato, 2017, p. 28)

In this chapter we will interpret the case of urban waste treatment as an example of mission-oriented innovation. How is the organisation of work in the municipality rigged to enable a balancing between problem setting and problem solving when trying to improve the sustainability of their waste treatment systems? How do they balance the needs of today with the needs of tomorrow? The objective of this chapter is thus to reflect upon how creating sustainable urban waste governance can be seen as an example of mission-oriented innovation, and how complementary forms of governance may improve the ability to develop long-term innovative and sustainable urban waste systems.

To explore these questions, the chapter will draw on theories about mission-oriented innovation and will purposely discuss the need for orchestration of broader sets of actors in order to enable a wider outlook when identifying and articulating the problems or missions to be solved. The chapter analyses innovation and sustainability in an urban waste system through the lens of valorisation pathways, and seeks to answer the following research question:

> How can the mission of sustainable urban waste treatment be understood in terms of problem setting and problem solving?

The chapter is structured as follows: following this introduction, the second section briefly outlines the theoretical framing of the chapter. In the third section, the research methods applied are presented. Section 5.4 presents the case study, and section 5.5 analyses and discusses the findings. Finally, section 5.6 concludes the chapter.

5.2 Conceptual framework

Before embarking on an analysis of the waste treatment system in the municipality of Oslo, the next sub-sections frame the case study within a mission-oriented innovation perspective. Following this, the analytical buildings blocks, consisting of the waste pyramid and notions of valorisation, will also be outlined.

5.2.1 Mission-oriented innovation

In the literature on mission-oriented innovation policies it is highlighted that long-term commitment to engaging public, private and third sector actors is key to successful implementation (Kattel & Mazzucato, 2018; Mazzucato, 2017, 2018). It has been pointed out how social movements are often central to the advocacy and development of innovative and sustainable regimes and solutions (Fagerberg, 2017), and how there is a need to include these actor groups in the selection environment when developing future strategies (Smith, Voß & Grin, 2010).

At the same time, the literature points to directionality as something vital to sustainability transitions and mission-oriented innovation (Fagerberg, 2017; Mazzucato, 2017; Schot & Steinmueller, 2018; Weber & Rohracher, 2012). The notion of directionality involves selection and priority setting, and has thus introduced and emphasised a stronger element of politics in our understanding of systems of innovation and socio-technical change (Shove & Walker, 2007; Smith, Stirling & Berkhout, 2005). This form of top-down directionality on the one hand and broad anchoring among diverse stakeholders on the other constitutes a range of actors that as of yet has scarcely been investigated. Consequently, it is acknowledged that it is important to gain a better understanding of the relationship and balance between directive and bottom-up interactions in mission-oriented innovation (Mazzucato, 2017).

As opposed to the innovation needed to solve grand societal challenges, mission-oriented innovation has traditionally been perceived as being primarily preoccupied with technological dimensions, whereas the organisational and social aspects of innovation have received less attention (Martin, 2015; Nelson, 2011). Nelson (2011) pointed out the puzzle of how a country that has managed to send a man to the moon is facing great difficulties when it comes to providing basic education and health services to overcome poverty. This is due to the intersectoral, social and complex nature of grand challenges, where there is seldom one solution that is widely agreed upon. More recently, contributions to the literature have actualised a debate on how to define and differentiate between so-called mission-oriented innovation and sustainable socio-technical transitions (Fagerberg, 2017; Kattel & Mazzucato, 2018; Mazzucato, 2017, 2018; Mowery, Nelson & Martin, 2010; Nelson, 2011). Here it is emphasised how traditional technology-oriented research and innovation policies appear deficient to address and tackle today's complex and integrated societal challenges.

Addressing this relationship, Mazzucato (2017, 2018) distinguishes between old and new types of mission-oriented projects, where the old were defined by a small and centralised group of experts, oriented towards specified technology development, and where diffusion beyond these actors was of minor importance. New mission-oriented projects, on the other hand, are characterised by broader involvement of actors in defining the direction of the mission; the missions have both technical and societal objectives, where the diffusion of solutions is paramount. The new missions also ascribe an important role to foresight analysis as part of the envisioning of potential future scenarios. Moreover, Mazzucato makes a distinction between grand challenges, missions and portfolios of projects that involve different actors and sectors in bottom-up experimentation (Mazzucato, 2018). In this sense, missions and (mission) projects can be perceived as operationalisations of the broader grand challenges. Mission-oriented innovation is seen to constitute a narrower and more clearly defined form of innovation than what is required to address grand challenges, which are more complex and multi-faceted. In parallel with the ability to set missions, it is seen as central to leave enough space for encouraging bottom-up experimentation across several types of public and private actors (Kattel & Mazzucato, 2018). Missions should also comprise a portfolio of R&D and innovation projects that allow for both success and failure, and they should have a trickle-down effect in which overall objectives should be translated into concrete policy actions. Importantly, missions should be based on a long-term agenda and draw on existing resources and policy instruments in the science and technology system (Fagerberg, 2018; Mazzucato, 2017). In order to approach pressing grand societal challenges in appropriate ways, there is a need to select missions that have enduring and democratic legitimacy, and moreover to define these missions in ways that allow sufficient breadth to motivate action across several sectors and societal actors (Kattel & Mazzucato, 2018; Mazzucato, 2017).

5.2.2 The waste hierarchy and different treatment options for organic waste

The various ways that local authorities can treat or deal with waste can be ranked according to a waste hierarchy or waste pyramid. In the hierarchy adopted by the EU (European Commission, 2008), the pyramid consists of five layers of progressively more sustainable options – disposal, recovery, recycle, reuse and prevention (see also Chapter 3). According to this line of thinking, less sustainable treatment options are at the base of the pyramid, while more favourable options are at the top (see Figure 5.1 below).

'Disposal' is at the bottom of the pyramid and represents the least sustainable option. Disposal implies that organic household waste is simply collected, transported and dumped at a landfill site. Although disposal can reduce

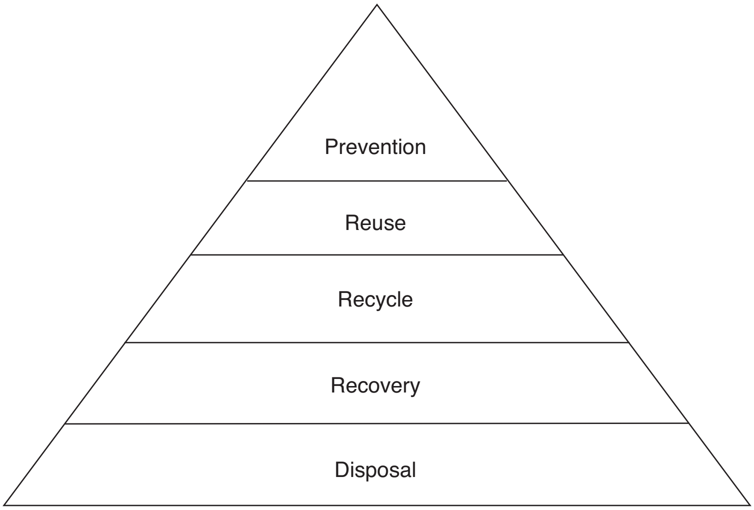

Figure 5.1 The waste pyramid.

pollution and prevent sickness within a city, landfills lay claim to land areas and can pollute ground water, air, lakes and rivers. Another implication of the use of landfills is that the waste is not sorted and precious resources cannot be recycled or recovered easily (Gee & Uyarra, 2013). 'Recovery' is a step up the pyramid and represents a more sustainable option than disposal. Recovery implies that at least some of the energy that lies within the waste can be used for some useful purpose. Recovery became a viable option in the 1960s and '70s, when urban waste was incinerated with greater and greater frequency in order to reduce the use of landfills in Europe. The incineration process contributed to air pollution and required the instalment of advanced filter systems and the use of very high temperatures. A by-product of the high temperatures used was that excess heat could be used in district heating systems, in this sense recovering some of the energy stored in the waste. Nevertheless, the ash resulting from the incineration process still has to be stored in landfills.

Recycling is another step up the pyramid and represents a more sustainable option than recovery. Recycling of organic waste often implies some sort of anaerobic process at a biogas facility where organic waste is turned into biogas (biomethane) and fertiliser. The only way to achieve the recycling of waste resources in cities is to sort the waste streams and manage them separately. For each waste stream – such as organic, paper, plastic and metal-based waste – different routes of recycling or recovery must be developed. This often implies that citizens must sort their waste before they dispose of it and that the different waste streams must be transported to and processed at different locations.

Reuse and prevention compose the top two levels of the waste hierarchy and are the most sustainable options. Reuse implies that organic resources are used again without breaking them down and reprocessing them (which is the case in a recycling process). A typical example of reuse is using leftover food as feed for animals. Prevention is the most sustainable option and forms the top of the waste pyramid. Typical examples of waste prevention are serving food on smaller plates at hotels or repacking of food items into sizes that fit the needs of the consumers and which do not generate leftovers. Reuse and waste prevention have emerged as the most important alternatives to pursue today in order to create more sustainable production and consumption patterns (Mourad, 2016).

In sum, urban organic waste can be dealt with in many different ways and these can have considerable implications for sustainability. The higher the waste treatment option is in the waste pyramid, the more sustainable the treatment option tends to be.

5.2.3 Valorisation of waste – importance of problem setting

When local authorities want to improve the sustainability of their waste treatment system, they have to engage in both 'problem solving' and 'problem setting'. When they engage in 'problem solving' but not in 'problem setting', the only possible outcome is to expand or improve their existing waste treatment system. For instance, local authorities can expand the collection and delivery of waste to its incineration plant, and thereby incinerate waste that might otherwise have been dumped on a landfill. Such activities improve sustainability, but the solutions are found on the same level in the waste hierarchy pyramid and further improvements will at some point be exhausted. To improve the waste treatment system further, local authorities need to find options outside the existing system and at a higher level in the waste pyramid. For instance, local authorities can recycle organic waste and turn it into biogas and fertiliser instead of incinerating it. We refer to this option as 'problem setting'. Of course, 'problem setting' also requires the solving of the identified problems.

When local authorities engage in 'problem setting', they are attempting to transition from one waste system to another. Transitions from one waste system to another are often very challenging, as an existing waste system will often be embedded and anchored in specific technologies, infrastructures and institutions that are not relevant to the new system (Frantzeskaki & Loorbach, 2010). The transition from landfill (disposal) to incineration (energy recovery) requires investment in incineration infrastructure to capture and exploit the energy from the waste. The transition from an incineration system (energy recovery) to a biological treatment system (recycling) requires new infrastructure, and altered behaviour from the citizens using the system, as a result of the need for sorted waste streams. In addition, there is a need for a market for the different waste streams (e.g. paper, plastics, glass, metal, textiles) and the products of biological treatment, such as biogas as a fuel and biosolids as fertiliser (Murray, 2002). The same is true for further movement up the waste pyramid to reuse and prevention. They require a 'fundamental re-think of the current practices and systems in place' (Papargyropoulou, Lozano, Steinberger, Wright & Ujang, 2014, p. 114).

Although it is possible to place different types of waste treatment at different levels of the waste pyramid, it is common for a regional waste treatment system to consist of more than one type of waste treatment. Today, the most common systems for processing organic waste are recovery and recycling-based, in the form of incineration and biological treatment systems. In this sense, problem solving and problem setting are activities that often overlap and co-exist.

5.3 Research methods and data

Our data collection is based on interviews, participation in policy and industry seminars and document analysis. We have conducted six explorative and semi-structured interviews with key stakeholders and representatives of the relevant waste management agencies and involved firms. We interviewed representatives from the following organisations and their departments (the names of the interviewees are anonymised): Avfall Norge, Østfold Research, Oslo municipality Department of Environment and Transport, Oslo municipality Waste-to-Energy Agency, Oslo municipality Agency for Waste Management and NorgesGruppen/ASKO. Most of the interviews were conducted face to face and lasted around one hour. The interviews were recorded and transcribed. We also organised two workshops on the subject, one with researchers in the field (November 2016) and the second with invited experts from the industry, public administration, NGOs and research (November 2017). In addition to the interviews and workshops, document analyses of reports and municipal strategies and media analysis have also constituted part of the data collection for the case study. Finally, field trips and participation in industry seminars and conferences have helped inform the study. The presentation of the case study is adapted from Bugge, Fevolden and Klitkou (2018).

5.4 Valorisation of urban organic waste: the case of Oslo

The governance of waste processing in Oslo is administered by three municipal departments: the Renovation Department (Renovasjonsetaten) is responsible for organising the collection and transport of municipal household waste, whereas the Energy Recovery Department (Energigjenvinningsetaten EGE) is responsible for the recycling of municipal waste (Bugge et al., 2018). Finally, the Department for Urban Environment (Bymiljøetaten) takes responsibility for the environment in the city, such as the quality of air, water and soil, and for the planning and development, management and operation of municipal urban spaces. These agencies are *coordinated* by the Vice Mayor for Environment and Transport.

These municipal departments do not operate in isolation. There are both national and international regulations that the municipality of Oslo must adhere to when developing their organic waste system. Among others, the municipality must adhere to the EU landfill ban of 2009 and the EU Waste Framework Directive of 2008, which Norwegian authorities have transposed into Norwegian law. The municipality must also adhere to The Norwegian Pollution Act, which states that municipalities have sole responsibility for the collection and processing of household waste, while private businesses are responsible for processing their own waste. According to the same Act, the municipality's handling of household waste should also be self-financed through fees and governed by waste regulations.

The municipality of Oslo has implemented a two-bin system, consisting of one bin for plastic, food and residual waste, collected one to six times a week, and one bin for paper collected one to four times a month. Citizens collect their food waste in green bags, their plastic waste in blue bags and their residual waste in neutral bags. All the bags are disposed of in the same household waste bin. Additionally, there are 910 collection points for glass, metals and textiles across the city. Moreover, the city has collections for hazardous waste, three large recycling stations, two mobile recycling stations and a regular collection of garden waste. The municipal waste processing system (Figure 5.2) includes optical sorting of waste resources from households, i.e. plastics, food waste and residual waste.

After household waste is collected in waste bins, it is delivered to a large sorting plant at Haraldrud in Oslo. At this facility, the three types of waste

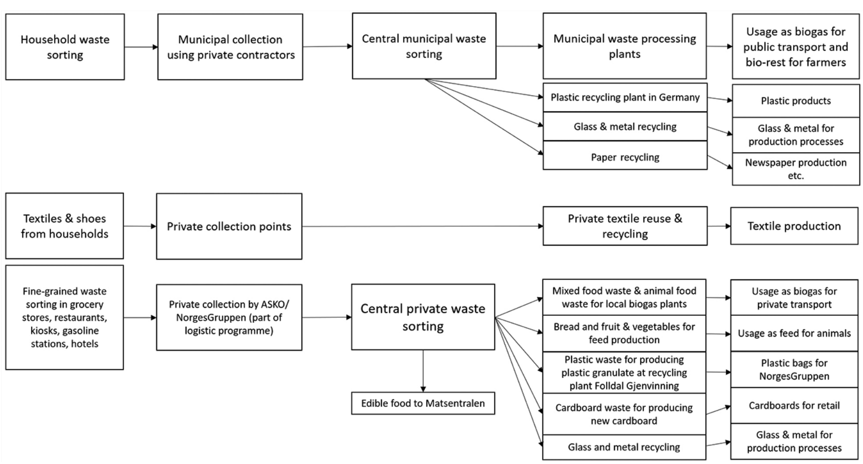

Figure 5.2 The parallel systems of waste management in Oslo (adapted from Bugge, Fevolden & Klitkou, 2018).

bags are sorted automatically by optical sensors: plastic waste goes to fine-sorting and recycling in Germany, food waste goes to the biogas plant in Nes in Romerike (outside of Oslo) and residual waste is incinerated in an energy recovery process after metal has been sorted out and removed. The ash residuals are sent to a landfill. The municipality plans to develop a pilot for carbon capture and storage at the incineration plant. The biogas plant at Nes was opened in 2013. It has the capacity to process 50,000 tonnes of food waste annually. The biogas is upgraded to liquid biogas (LBG) in a process that extracts CO_2 and reduces the volume of the biogas. The municipal biogas plant also produces bio-residuals, which are sold to neighbouring farmers as fertiliser. The produced LBG is used for the public transport system of Oslo.

In Oslo, the collection and processing of waste is divided between the public and private sectors respectively. Because of its corporate legal structure, EGE in Oslo cannot easily buy or process waste from the private sector and is instead restricted to processing household waste from the municipality of Oslo. Meanwhile, the public biogas plant at Nes in Romerike runs below capacity, and only 40% of organic household waste is treated there. Currently, the municipality has no responsibility for food waste from private businesses. This restriction makes it difficult to reduce the operating costs of the biogas plant. However, ongoing experiments with adding manure as an additional feedstock might improve the cost efficiency of the Nes biogas plant.

In parallel to the public waste collection and processing system in Oslo, the private sector has developed its own system for waste management. Over the last ten years, a large private actor, ASKO, has specialised in processing food waste from private businesses. ASKO is the wholesale and logistics business partner of one of Norway's largest grocery wholesaling groups, NorgesGruppen, which owns a number of grocery stores, restaurants, kiosks, gasoline stations and hotels. The reuse and recycling element of the logistics business includes the collection of food for redistribution by a charity organisation to reduce food loss (Matsentralen), the return of bottles and boxes, cardboard and paper recycling, plastic recycling and the reuse of different types of containers, etc. ASKO's trucks deliver food to retailers and bring their sorted waste products back for recycling on the return trip. This practice avoids the driving of empty trucks and reduces fuel costs and emissions. The collected waste streams are material-recycled: food waste as biogas, plastic waste as plastic resources, cardboard and paper for paper recycling, etc. Plastic waste is delivered to Folldal Gjenvinning, which produces a recycled interims product, a plastic granulate, which is used as a resource in NorgesGruppen's plastic bag production. The sorting of the plastic waste from private businesses is more fine-grained than the public household plastic waste, where different types of plastic are mixed, which results in a lower quality of the recycled interims product (see Table 5.1).

The introduction of the recycling system in NorgesGruppen started in grocery stores, lasting from 2004 to 2009, with the ambition of learning the

Table 5.1 Selected indicators on waste generation in Oslo, 2015

Number of inhabitants	975,744
Area in km^2	266
Household waste per inhabitant in kg	336
Waste delivered to material recycling and biological treatment per inhabitant in kg	130
Share of waste delivered to material recycling, including biological treatment in %	39
Share of waste delivered to incineration in %	58
Share of waste delivered to landfills in %	3

Source: SSB Kostra.

fine-sorting of waste streams. In 2010, the first pilot including the establishment of new value chains based on the sorted waste streams was initiated. Then, after the sorting routines were well established, this was implemented by all ASKO enterprises from 2011 to 2012, and ASKO took over the logistics and transport of the sorted waste resources.

Commodity markets exist for the interim products: e.g. a secondary raw material market for items such as cardboard, plastics and metals. ASKO is able to earn revenue from these types of waste, but for food waste generating a profit is more challenging. Currently, ASKO is working to separate two types of food waste, with different objectives: bread, fruit and vegetables for feed production, and other food waste – mixed food waste and animal food waste – for biogas production. This can be done because food waste from private businesses is not mixed in the same way as food waste from households; e.g., bread that is not sold can be used as a resource for feed production. The biogas component is used in a large number of local biogas facilities. There is a conflict between the use of waste resources for energy on the one hand and for recycling, including feed production, on the other. ASKO has decided to prioritise environmental investments over economic investments and believes that this can also be legitimised economically by taking a more long-term perspective.

Besides large actors such as the municipal administration and private companies like ASKO, there are several smaller niche projects which are attempting to exploit organic waste for new purposes, such as utilising coffee gravel from coffee shops in the production of mushrooms or soap or establishing low-price lunch restaurants which serve food that would otherwise have been thrown away. This lack of coordination across parallel public and private subsectors in the processing and treatment of organic waste in Oslo shows the fragmented infrastructure of waste processing, and potentially limits critical mass and synergies across sectors and waste streams.

5.5 Analysis: urban waste valorisation as a mission

Addressing the research question presented at the outset of the chapter – *How can the mission of sustainable urban waste treatment be understood in terms of problem setting and problem solving?* – this section will discuss and reflect on the relationship between problem solving and problem setting in the governance of a mission-oriented innovation endeavour such as urban waste treatment.

5.5.1 What is the mission given – and to whom?

In Oslo, the public agency Energigjenvinningsetaten (EGE) has served as the main driver and coordinator for developing and implementing the circular system of processing and recycling the different streams of household waste generated within the municipality.

The municipality has been central in directing the system towards greater sustainability by establishing a waste sorting plant, a biogas facility and a waste incineration and district heating system. The rationale for the circular waste agenda and for building these facilities was a mandate issued by from the municipality of Oslo.

> The politicians decided in 2006 that they wanted sorting of plastic packaging and food waste from the households, and they decided to have a 50% recycling target.
>
> (Respondent from the Agency for Waste Management in the City of Oslo)

> We got the assignment in 2005–2006 to develop a system for circular waste recovery in Oslo. Then we built the sorting plant and the biological treatment plant, and the district heating company has developed and extended the district heating system.
>
> (Respondent from the Agency for Energy Recovery in the City of Oslo)

The initiatives taken to develop a circular recycling system ensured a shift of focus from energy recovery to recycling, beginning in the early 2000s. Still, after having arrived at the current recycling system, which is underpinned by heavy investment in *infrastructure* and *institutions* (e.g. the biogas plant, the sorting plant, the collection of household waste and household routines of sorting waste), there are few signals that the municipality is taking the lead with a new waste prevention system. This is not surprising, as the mandate of the Energy Recovery Department primarily targets an effective exploitation of the waste generated.

> We will sort as much as we possibly can, that is our perspective.
>
> (Respondent from the Agency for Energy Recovery in the City of Oslo)

> The biggest challenge is to get people to recycle more.
>
> (Respondent from the Agency for Waste Management in the City of Oslo)

In this sense, a waste prevention mandate or mission contrasts with the current institutional rationale or logic of the municipal Department for Energy Recovery. Thus there is reason to question whether the focus and mission to create a circular recycling system is really the best and most sustainable solution for a city such as Oslo – at least if such a system requires constant flows of waste to be economically viable, and thus constitutes disincentive to strive for waste reduction or prevention. One of our respondents confirmed that this is often the case.

> We in the waste business are constantly talking about processing waste instead of reducing waste. And to reduce must be done early on and intelligently and with the right design.
>
> (Respondent from the Agency for Energy Recovery in the City of Oslo)

One may argue that the capacity and demand for waste shown in the Oslo case constitutes a system that is oriented towards developing new value chains stemming from urban (organic) waste, and where the transition agent (EGE) has made heavy investments into the physical infrastructure enabling this production. At the same time, EGE has no financial incentives or political mandate to reduce the amount of waste in the first place. This type of sustainability mode, oriented towards recycling, is thus in conflict with demands for more circular eco-design aimed at limiting or preventing waste. In consequence, other types of actors – such as civic organisations (e.g. the student association) or private enterprises (e.g. Kutt Gourmet restaurant at the University of Oslo, and Matsentralen) – are now the ones pushing the waste prevention agenda forward as the next stage of system change in urban waste.

The Renovation Department and the Energy Recovery Department are the most central actors in any attempt to achieve higher levels of waste recycling in the municipality of Oslo. As we have seen, the Renovation Department is in charge of collecting and transporting waste from citizens, whereas the Energy Department is in charge of processing the different types of waste collected.

Our impression is that there is not much collaboration across departments in the municipality in relation to waste reduction, due to contrasting roles and mandates.

> They [the Agency for Waste Management] have a responsibility for waste reduction, and that is the opposite in relation to what we do if we only see ourselves as a producer of energy. So far, waste reduction has not been debated as much as recycling. I don't know how much they're

> working on it either, really. They have a clear historical role in ensuring that waste is safely removed from the city and handled properly. That's the most important task they have.
>
> (Respondent from the Agency for Energy Recovery in the City of Oslo)

This observed lack of coordination across the public and private sectors is an example of how existing working practices in silos do not facilitate cross-sectoral collaboration towards common goals. Such forms of silo-based organisation within and beyond the municipality represent fragmented incentive structures and a potential barrier to more radical innovation and change.

5.5.2 How are missions defined? From problem solving to problem setting

The legal regulations of waste treatment governance in Oslo restrict public actors from processing waste from the private sector and vice versa. This may constitute a somewhat rigid institutional framework and limited incentives and action space for innovation. A natural consequence of the fragmented relation across the public and private sectors in Oslo is potentially limited joint reflexivity and learning across the two domains. The tendering practices observed in Oslo associated with extensive outsourcing of municipal service provisions for collecting waste and transportation to private contractors also establish clear boundaries between the commissioner and the contractor, which may serve to hinder dialogue and mutual learning. Relatively standardised services such as waste collection and transporting have been outsourced to private contractors, whereas the development and planning of the processing of the waste streams is accomplished in-house in the municipality.

Traditional bureaucracy and silo-based working practices in the public sector typically execute power and set top-down political goals, which serves to give direction for system change. Internal direction setting in collaboration with the political level and EGE, and the creation of a circular system of bio-fertiliser and biogas to be used in the Oslo region, signals a traditional bureaucratic type of governance. EGE's ownership of the infrastructure and facilities also reflects a bureaucratic governance regime, which may constitute a barrier to process innovation in terms of synergies with other waste streams from the private sector.

As such, it seems appropriate to question the balance and relationship between problem setting and problem solving in the governance of urban (organic) waste in Oslo. Each municipal department has their respective mandates and there is limited coordination or joint experimentation across municipal departments. One potential limitation to such a governance mode is a weakened ability to broaden perspectives and raise ambitions in relation to sustainability in urban waste treatment. In principle, such a deficit could have been addressed at the national level. However, although Norway has a national organisation working with waste policy issues (Avfall Norge) and an interest organisation representing all municipalities (KS), there is a lack of coherence across waste systems and legislation in different municipalities, and there are several ongoing innovative projects aiming to transform existing municipal waste processing systems which unfold independently of each other. There is no dedicated national policy programme representing a coordination mechanism for joint reflexivity, learning and diffusion across municipalities in the case of waste. In consequence, the lack of coordination of experience sharing and mutual learning may paradoxically increase long-term costs and limit the effects of ongoing initiatives within the existing cost-oriented regime.

5.6 Conclusions

This chapter has sought to interpret the case of governance of urban waste as an example of mission-oriented innovation. Based on the insights gained from a case study of waste treatment in Oslo, we have discussed how governance of urban waste valorisation may be understood in terms of balancing between problem solving and problem setting.

The case study has shown how the work with waste treatment in Oslo can be interpreted as an expression of a traditional and narrow form of mission-oriented innovation policy, where the objectives have been clearly defined within the public sector domain rather than by a broad constellation of societal actors. The municipality of Oslo has been guided by political strategies aiming for a 50% recycling target. Such a target does not represent any incentive for waste prevention, but represents a technical specification that may contribute to the formation of a lock-in of the recycling stage in the waste hierarchy. The development of a circular system for the recycling of household waste constitutes a value chain that can be seen as a disincentive to support efforts to reduce waste streams in the first place. It seems as if the dynamics observed actualise a discussion of whether and how the political direction and mission given have been too specific and narrow, thus limiting the long-term action options available to the problem solvers involved. This type of (top-down) directionality contrasts with the joint and negotiated paths of directionality prescribed in the literature on transformative change (Weber & Rohracher, 2012). To avoid long-term lock-ins and to enable leaps upwards through the waste hierarchy, it appears more appropriate to operate with more open-ended and functional requirements with regard to sustainable development than to specify which sort of solutions are sought. This resembles the insight derived earlier from studies of innovative public procurement, which have concluded that functional requirements should be preferred to technical specifications in public tenders (Edquist & Zabala-Iturriagagoitiaa, 2012).

In addition to operating with functional requirements in their setting of the mission to be solved, the municipality could also have benefited from including a more diverse set of actors such as the private sector, social movements and lobby groups, into the identification and articulation of missions to be addressed and achieved. However, such working practices would call for a more networked and coordinated form of governance that contrasts with current bureaucratic, sectoral and silo-based municipal departments and working practices. It thus seems opportune to supplement current silo-based working practices with more networked governance to mobilise broader sets of societal actors into a joint reflection on possible alternative and viable ways forward towards increased sustainability in existing urban waste systems. Such an approach would be an effective response to the call for a better understanding of how the public sector can encourage more dynamic capabilities (Kattel & Mazzucato, 2018) and democratic processes in which missions are defined (Mazzucato, 2017).

Note

1 This chapter draws upon a recent paper published in *Research Policy* (Bugge, Fevolden & Klitkou, 2018). Here we take a closer look at one of the three cases presented in the original paper, and we apply another analytical framework. Instead of governance regimes, we here discuss the importance of problem setting to mission-oriented innovation in urban waste valorisation.

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