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Anna Bernstad Saraiva Schott
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Jes la Cour Jansen

Modern
Solid Waste
Management
in Practice
The City of Malmö
Experience

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Preface

This book provides an example of how municipalities can work toward increased sustainability within the solid waste management area through an overview of the development in the City of Malmö, Sweden over the last decade. Organizational structures, collaboration forms with industry and academia, technologies for waste collection and treatment, as well as methods for evaluation developed in the city, are presented, based primarily on two case studies performed from 2000 to 2010. The book also discusses future challenges in the search for constantly increasing sustainability in the urban solid waste management area.

The book contains both an overall description of the case of the City of Malmö, presentation of research results based on several case studies performed in collaboration between the City of Malmö, private industry and the academia, as well as presentation of methods that can be used for evaluation of the sustainability of solid waste management strategies, which can also be transferred and used in other cities and contexts. Thus, the book is aimed at public servants and policy-makers at municipal/regional level, research and development-oriented waste management industries, as well as university professors and students.

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Abstract

Sustainability has, since the end of the 1990s, been a leading word in the solid waste management in the City of Malmö, Sweden. This book presents the work performed within the city based mainly on the two full-scale experiments Bo01—novel technologies in new developments, and Augustenborg—introduction of modern waste management in existing residential areas. In both cases, a close collaboration with academia has led to thorough evaluation of used waste management strategies and technologies, and thus decision-making based on scientific outcomes. This book presents the development of organizational structures, collaboration forms among the public sector, industry and academia, technologies for waste collection and treatment as well as methods for evaluation. The book also discusses future challenges in relation to, amongst others, urban planning, decision-making structures, behavioral changes and development of waste management infrastructure, seeking constantly increased sustainability in the urban solid waste management area. Finally, the book highlights the importance of viewing solid waste management as a core element in the development of the sustainable city.

Keywords Sustainable urban development · Solid waste management · Organic waste · Food waste grinders · Vacuum systems · Waste composition analysis · Life-cycle assessment · Triple helix

Chapter 1

Sustainable Waste Management in a Changing Environment

Keywords Solid waste management · Modern municipal waste management · Solid waste legislation · Environmental objectives · Demography · EU waste hierarchy

1.1 The City of Malmö: Aiming to Become the World Leader in Sustainable Solid Waste Management

World class waste management is a prerequisite for sustainable urban development.

This has been the overarching vision for the development of solid waste management in Malmö over the last decade. The current municipal waste management plan has a deeply holistic view, acknowledging the strong link between sustainable consumption and waste management, and giving decision makers in the municipal waste management organization a strong mandate to prioritize environmentally beneficial alternatives over less costly but more polluting ones. This vision also acknowledges the need to incorporate waste management planning into the wider sustainable urban development context—not as an “add-on,” but as part of the core in any development project.

But how did the City of Malmö reach this point? The aim of this book is to describe the trajectory over the decade, including strategic thinking, organizational developments, technology choices, and evaluation methods. One of the main aims is also to describe the triple helix collaboration form used in the City of Malmö, where the municipality has developed strategies and achieved high performance in the area of solid waste management together with both the private sector and academia.

The development within the solid waste management area in the Malmö over decade has resulted in five major outcomes:

- Development of forms and methods for successful triple helix collaboration in full-scale development projects.
- Applying multidisciplinary evaluation methods for assessment of different aspects of solid waste management systems.
- Using life-cycle assessment methodology as a decision support tool for waste collection and treatment alternatives, as well as for identification of hot spots with high environmental impact on the solid waste management treatment chain as a basis for continuous improvements.
- Increasing the view of solid waste management as one of the core areas in urban development.
- Develop new and improve known systems and technologies for urban solid waste management.

Following this, the process of reaching these outcomes is described and discussed, based on four full-scale development projects performed in the City of Malmö over the period 1999–2012. While the first two projects have been finalized, the latter two are still in a startup or development phase:

- The Bo01 project—Novel technologies in new developments.
- The Augustenborg project—Introducing modern waste management in existing residential areas.
- Fullriggaren—Building on previous experiences for further improvements.
- Hyllie allé—Achieving integration of solid waste management in the urban planning process.

But first, the context in which these developments have been made must be described. Thus, in this chapter, the outline of Swedish waste management is presented in relation to national and regional legislation and objectives. In [Chap. 2](#), the history of Malmö over the last few decades is presented in relation to its demographic and economic developments. Also, the waste management organization in the city is presented. [Chapter 3](#) gives an introduction to the collaborative structures developed between academia, the municipality and industry in the area of solid waste management in Malmö over the last few decades, while [Chap. 4](#) presents the two development projects, Bo01 and Augustenborg, in further detail, including the methods used for evaluation of the projects. In [Chap. 5](#), the outcomes of the projects are presented and discussed in the framework of sustainable solid waste management. [Chapter 6](#) provides an overview of the two new development projects, Fullriggaren and Hyllie allé, and discusses future challenges related to solid waste management in general and for Malmö in particular.

1.2 Waste Management then and Now

According to the UNEP (2013), some 11.2 billion metric tons of solid waste are currently being collected around the world every year. The decay of the organic fraction in this waste is contributing to around 5% of the global greenhouse gas emissions. Increased focus on waste management in development work, an increased focus on material recycling, and other means for reduction of negative environmental impacts from waste management, may have to some extent, decreased the negative impact of solid waste management over the last few decades (UN-HABITAT 2010). Examples of new legislation in the area of solid waste management have been seen in areas, such as the EU (EU waste framework directive 2008), Brazil (Brazilian Parliament 2010) and South Africa (Republic of South Africa 2008) with an enforced focus on minimizing the negative environmental impacts of solid waste management. However, the last few decades have also shown rising amounts of waste generation in the world. For example, between the years 1980 and 2005, the total quantity of municipal waste per capita increased by 29 % in North America, 35 % in OECD countries (Sjöström and Östblom 2010). As highlighted by Sjöström and Östblom (2010), the same period showed a strong link between economic growth and increased generation of solid waste. Although the need for decoupling these has been discussed, examples of such are few—if any. Thus, the benefits derived from reduced impacts of solid waste management are counteracted by increased generation of waste in absolute terms.

Sweden has in many ways been progressive in development of solid waste management. A short introduction to the current situation is presented below:

A national legislation on producer responsibility was introduced in Sweden in 1993 for packaging made from glass and cardboard. This was followed in 1994 by similar regulations also for packaging made from metal, plastic, and paper, as well as newsprint. According to this legislation (Ordinance of Producers' responsibilities for packaging) all companies that produce, import, or sell packaged goods on the Swedish market shall:

- ensure that a collection system exists, through which customers and other end consumers can return used packaging
- ensure that customers receive the information they need about the collection of used packaging
- ensure that collected packaging is recovered, recycled, and put to good use as either new raw material or energy.

Companies affected by this law have created a common system for the collection and recycling of packaging under the Ordinance. Companies affiliated with this system pay a fee in relation to the amount of packaging material their operations generate. Fees are used to cover costs for collection, transportation, and information related to the packaging recycling system. Currently, nearly 10,000 companies are affiliated with the system (FTI 2013).

Also, according to the legislation, households are required to separate material under the producer responsibility legislation from residual waste, and make use of the systems developed for waste recycling.

Since 1994, producer responsibility legislations and systems have also been implemented for cars, tires, batteries, pharmaceuticals, waste electronic equipment (e-waste), and radioactive equipment. A voluntary system has also been in place for office paper since 1996.

For waste not affected by the producer responsibility legislation, i.e., residual waste (including food waste), bulky waste, and hazardous waste,¹ collection and treatment is governed by a municipal monopoly. However, both collection and treatment can be performed by private companies, contracted by the municipality.

Collection and transportation of waste under the municipal monopoly is in almost 75 % of the Swedish municipalities, carried out by private entrepreneurs, and, in the other 25 %, by the municipality itself (Swedish Waste Management Association 2010). In the case of packaging material and newspaper, different companies can be contracted for collection of different waste fractions (i.e., cardboard, glass, plastics, etc.).

In 2005, a national environmental objective was introduced by the Swedish government, stating that, by the year 2010, 35 % of the food waste from households, industrial kitchens, and restaurants should be collected separately and treated biologically. This target was not met; in 2010, only 11 % of the food waste from these entities was collected separately for biological treatment. In 2012, the objectives were sharpened, and now state that, by 2018, 50 % of the food waste from these entities should be collected separately (SEPA 2012). By April 2012, 105 out of a total of 290 Swedish municipalities had introduced separate collection household food waste, and a further three reported that they would implement such schemes in the coming year.

In relation to information, municipalities are responsible for providing households with the necessary correct information regarding management of household waste, including waste under producer responsibility legislation. In the case of batteries and e-waste, producers have full responsibility to provide the respective information to households.

As a consequence of a more widespread use of on-site separation of recyclables² in Sweden in later years, Swedish real estate owners also play an increasingly important role in the management of solid household waste. This often means that real estate owners themselves also provide information regarding separate collection of packaging and newspapers, as well as residuals and food waste, to their customers (householders).

¹ Hazardous waste, with the exception of batteries, since 1st January 2009.

² Possibilities for household waste separation in direct connection to residential buildings, often in waste disposal areas inside multifamily dwellings or recycling buildings in larger residential areas.

Plants for recycling of packaging materials and newspapers are, in many cases, privately owned, whereas treatment of residual waste and bulk waste is often conducted by treatment enterprises owned by one or several municipalities. In the case of food waste, treatment plants are commonly owned by one or several municipalities, but several privately owned plants for anaerobic digestion of such waste exist.

Based on the above, it is seen that the responsibility for solid household waste management in Sweden is divided among several different agents (Fig. 1.1).

Thus, the Swedish model for management of solid household waste involves many different actors. This has resulted in several collaborative organizations, where different actors work together to fulfill policies and regulations. One example is El-retur, a collaboration between Swedish municipalities and the organization of retailers of electronic devices on the Swedish market (El-kretsen), with the objective of facilitating communication and collaboration between the municipalities and industry in order to fulfill the objectives stated in the WEEE-directive (European parliament 2002).

However, this can also result in situations where the division of responsibilities among different actors involved in the waste treatment chain not always is clear, confusion among the user of the system—households, enterprises, and the public, as well as economically and environmentally suboptimal waste management. An example of this was pointed out by Dahlén (2008); when the separate collection

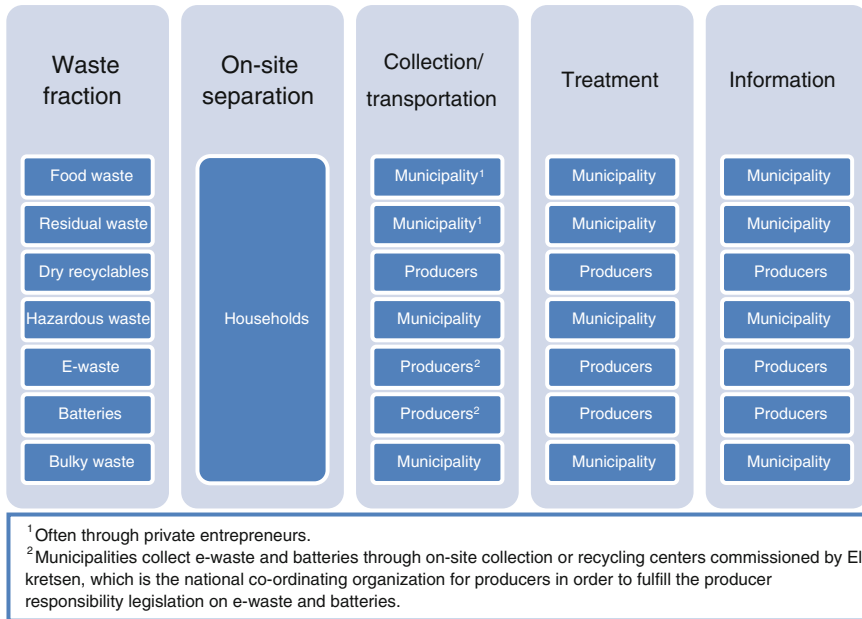


Fig. 1.1 Graphical representation of the division of responsibilities of Swedish solid waste management

and recycling system of the producers do not meet requirements (for example, result in overfull or untidy recycling points), usually local authorities must step in and solve the situation (Dahlén 2008). This naturally results in costs for the local waste authority—costs that must be covered by the charges collected from the inhabitants. This is also the case when recyclables under the producer responsibility legislation is collected on-site, as collection fees in such cases are paid by the property owner, but commonly transferred to households. Thus, the inhabitants pay twice: first, as a recycling-fee paid to the producers (included in the price when buying a product) and, second, as an unnecessarily high charge for solid waste management paid to the local authorities, or as an extra charge paid by households in case of on-site separate collection of packaging material.

1.3 Factors to be Considered in Modern Municipal Waste Management Policy-Making

1.3.1 Legislation and Objectives

Swedish solid waste management is largely influenced by EU legislation. The EU waste framework directive (WFD) (European Parliament 2008) was implemented in Sweden in 2011. The EU WFD emphasizes that legislation and policy of EU member states shall apply to the waste hierarchy (Fig. 1.2), and contains recycling and recovery targets to be achieved by 2020: 50 % preparing for reuse and recycling of certain household waste.

This is demonstrated at municipal level, for example, through mandatory reporting of municipal waste management plans at national level (i.e., to the

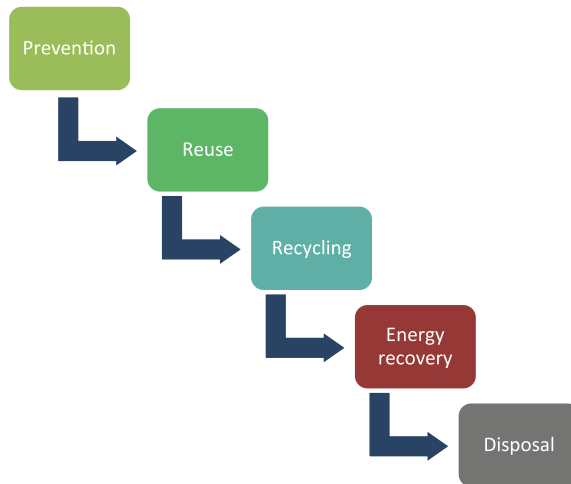


Fig. 1.2 EU waste hierarchy

Swedish Environmental Protection Agency), providing an infrastructure that makes it possible to achieve the waste recycling objectives and an enforced work related to waste minimization.

The national legislation contains, among others, responsibilities and regulations related to the transportation of household waste, hazardous household waste, e-waste, packaging, and other waste types under the producer responsibility legislation. In general, the municipalities are responsible for collection and transportation of household waste (including hazardous waste and bulk waste), other than waste fractions under producer responsibility legislation.

Since 2005, 16 National Environmental Quality Objectives should have an influence on all Swedish policy-making (Swedish Government 2004). Several objectives are related to solid waste management (Table 1.1). These objectives should be guiding both national policy-making in the waste management area, as well as municipal waste management plans.

Solid waste management is, of course, more relevant in relation to some of these objectives than others;

In the objective, “A Good Built Environment,” it is stated that:

- The amount of solid waste generated in Sweden, as well as its hazardousness, should decrease.
- Fifty percent of food waste from households, industrial kitchens, and restaurants should be collected separately and biologically treated by 2018. Of this, 40 % should be treated so that its nutrient and energy content is recovered.
- The objective also sets targets for material recycling of packaging made from metal, glass, plastic, and paper/cardboard, as well as of newspapers/magazines.
- A target was established in relation to construction and demolition (C&D) waste, where 70 % of the mass of nonhazardous C&D waste should be recovered by 2020.

Table 1.1 Sweden’s 16 environmental quality objectives (Swedish Government 2004)

1. Reduced climate impact
2. Clean air
3. Natural acidification only
4. A nontoxic environment
5. A protective ozone layer
6. A safe radiation environment
7. Zero eutrophication
8. Flourishing lakes and streams
9. Good-quality groundwater
10. A balanced marine environment, flourishing coastal areas, and archipelagos
11. Thriving wetlands
12. Sustainable forests
13. A varied agricultural landscape
14. A magnificent mountain landscape
15. A good built environment
16. A rich diversity of plant and animal life

Solid waste management is also relevant in relation to the objective, “Reduced climate impact,” through production of renewable energy from organic waste, nutrient recovery from biologically degradable waste, increased material recycling, energy recovery from non-recyclable waste, and decreased land-filling. The same aspects also have a strong link to the objective, “Clean Air,” which is also influenced by the legislation on waste incineration. Increased care in the management of waste with a high content of ozone depleting gases, as well as the introduction of systems for the collection of other types of hazardous waste, have had great importance in relation to the objectives, “A Non-Toxic Environment,” “A Protective Ozone Layer,” and “A Safe Radiation Environment.” These systems, as well as care in relation to land-filling with waste or residues from waste incineration and destruction of hazardous waste, are of importance in relation to the objective, “Good-Quality Groundwater.” Thus, solid waste management is of great importance in relation to a large part of the Swedish national environmental objectives (Fig. 1.3).

Environmental protection legislation can be relevant in relation to municipal waste management through tolerance limits regarding the noise of waste collection vehicles. Developments in working environment legislation have in recent years has improved the working conditions for waste collectors, which has resulted in legislation concerning maximum distances for manual transportation of wastebins, etc. Legislation in the traffic safety area can cause challenges for the collection of solid waste from residential areas where heavy traffic has been prohibited.

Fig. 1.3 Swedish national environmental objectives related to the objective, “Good Built Environment.”
Illustration Tobias Flygar



1.3.2 Demographic Trends, Attitudes, and Economy

Sweden, like many other countries, has, in later years, experienced a strong urbanization trend. As an example, the populations in Stockholm, Gothenburg, and Malmö (the three largest cities), in all cases, increased 8–10 % between 2005 and 2010. This has caused an increased need for urban densification, in order to avoid urban sprawl. Newly constructed areas with narrow streets and penthouse constructions on top of already existing buildings are some of the methods undertaken. However, these strategies also increase the challenges faced by solid waste management.

Not only the total population, but also the ethnic composition has changed in several Swedish municipalities. In 2010, the fraction of inhabitants born outside Sweden reached 22 % in Gothenburg and Stockholm. In Malmö, this fraction was over 30 % in the same year. The multitude of different ethnic backgrounds introduces a cultural richness in the city, but can, with regard to, solid waste management, also result in challenges, especially in relation to information strategies. Information written in Swedish might be insufficient to reach large groups. Thus, new information strategies must be used to reach households regarding separate waste collection and the environmental benefits related to this. The ethnic diversity can also result in a high diversity of gastronomic traditions, where waste types previously not common in the society, as well as other lifestyle differences, can lead to new challenges for the municipal waste management system.

Households and enterprises included by the municipal monopoly of waste collection and treatment have expectations of sound, noncomplicated, effective, hygienic, and cost-efficient solid waste management, which must be addressed by the municipality in order to maintain the credibility of these users. This is also related to an increasing awareness of environmental issues among the users. An example of this is the questioning of the environmental gains related to separate collection and recycling of waste, when this can be connected to increased need for transportation, washing of packaging material prior to source-segregation, etc.

Today, several municipalities are also working to constantly increase esthetic values in the urban environment. Challenges can emerge in relation to such values and the need for public recycling points, public litter bins, buildings for on-site separate collection in residential areas, etc. Source segregation will commonly also increase the space needed for waste disposal. Thus, introducing for on-site separate collection in existing buildings and areas with dense construction, such as older city centers, is often challenging.

Municipalities are challenged by increased demands from users to be cost-effective, i.e., provide good service at low cost. According to Swedish legislation, all costs connected to municipal waste management shall be covered by a charge paid by the users of the waste management services, rather than through taxes. Also, charges must be set on levels covering only the actual costs of the waste management, without generating profits (SFS 1991).

The charge consists of two parts; a fixed charge, covering costs of public recycling centers, transportation, and treatment of bulky waste and hazardous waste,³ planning and administration of waste management as well as information; and another, dynamic charge, covering costs for transportation, and treatment of residual waste and food waste.

Several municipalities have the ambition to set their waste management charges in a way that promotes environmentally friendly behavior among users. One example is waste-based charges on residual waste or a decreased charge related to collection and treatment of separately collected food waste, at the expense of a higher charge on residual waste. However, as presented above, the municipality's possibilities to adjust waste management charges in a sense which promotes environmental procurement are limited by Swedish legislation.

The cost of waste management is, however, generally low in comparison to many other costs borne by households. Several studies have shown that the impact from increased municipal waste management charges on the household's waste behavior is low, especially in rental areas (Swedish Waste Management Association 2011). However, a differentiation of charges for different types of waste collection subscriptions (for example, related to collection frequency) can be of importance in relation to detached houses where the cost is more visible to the household (Bernstad 2013).

1.3.3 Potential for Conflicting Interests

The text above exemplifies several aspects of how solid waste management in modern cities has to address a series of different requirements imposed on different actors at the local, national, and supranational levels (Fig. 1.4). In this mosaic of actors and interests, certain interests might sometimes conflict. Some examples:

- Legislation of public procurement might make it difficult for the municipality to be flexible in relation to special collection and treatment arrangements in cases where this could be motivated from an environmental point of view and in line with national environmental objectives.
- Increased competition for specific type of wastes in an open market (for example, organic waste with high biogas potential) could make it difficult for the municipality to plan investments in treatment technology, although this would be in line with national environmental objectives.
- Large investments in incineration plants and district heating systems might decrease the interest in increased on-site separation of recyclables with high energy content, such as plastics.

³ Costs related to collection of recyclable materials under the producer responsibility ordinances should be covered by producers.



Fig. 1.4 Graphical representations of different interests affecting municipal policy-making in modern cities, based on the example of Malmö

- Legislation related to the working environment might reduce possibilities for separate collection of heavy waste fractions, such as food waste or hazardous waste.
- Improving possibilities of on-site separation of dry recyclables can be connected to increased costs for packaging producers (through the producer legislation on packaging), while decreasing the municipality's costs of handling residual waste.
- Users of municipal waste management services (i.e., mostly households) might not have a high willingness to pay for waste management services. At the same time, the municipality must abide by the legislation and achieve objectives with a budget covered by user charges.

Balancing different interests and finding solutions where all the actors involved are satisfied is therefore one of the greatest challenges in modern municipal waste management policy-making and the daily work of the municipal waste management department.

References

- Bernstad (2013) Bakgrundsstudie inom projektet: KOMKOM – Kommunal kommunikationsstrategi för ökad och förbättrad insamling av matavfall, Biogas Syd, Malmö (in Swedish)
- Brazilian Parliament (2010) National solid waste law of August 2nd, 2010. Law 12.305/2010. Brasilia
- Dahlén L (2008) Household waste collection: factors and variations, Doctoral thesis Luleå University of Technology, p 33
- European Parliament (2002) Directive 2002/96/EC of the European parliament and of the council of 27 January 2003 on waste electrical and electronic equipment (WEEE)

- EU waste framework directive (2008) Directive 2008/98/EC on waste (Waste Framework Directive). <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT>
- European Parliament (2008) Directive 2008/98/EC of the European parliament and of the council of 19 November 2008 on waste and repealing certain directives
- FTI (2013) Förpacknings- och Tidningsinsamlingen. www.ftiab.se
- Republic of South Africa (2008) Waste Policy and Regulation, WASTE Act, 2008 (Act No. 59 of 2008). <http://sawic.environment.gov.za/?menu=13>
- SEPA (2012) Swedish environmental objectives. Swedish Environmental Protection Agency, Stockholm. <http://www.naturvardsverket.se/Miljoarbete-i-samhallet/Sveriges-miljomal/Miljokvalitetsmalen/>
- SFS (1991) Kommunallagen, Svensk Författningssamling (SFS) 1991:900
- Sjöström M, Östblom G (2010) Decoupling waste generation from economic growth. A CGE analysis of the Swedish case. *Ecol Econ* 69:1545–1552
- Swedish Government (2004) Environmental quality objectives – a shared responsibility, 2004/05:150, Stockholm
- Swedish Waste Management Association (2010) Swedish waste management 2009. Swedish Waste Management Association, Malmö
- Swedish Waste Management Association (2011) Viktbaserad avfallstaxa – en litteraturoversikt/ Weight based fees – a literature review. Report U2011:10
- UN-HABITAT (2010) Solid waste management in the world's cities : water and sanitation in the world's cities 2010. UN-HABITAT, Nairobi. ISSN: 9781849711708
- UNEP (2013) Climate change mitigation, waste, <http://www.unep.org/climatechange/mitigation/Waste/tabid/104349/Default.aspx>

Chapter 2

The City of Malmö as a Case Study

Keywords Urban development • Local waste management • Waste management organization • Urban transition

2.1 From Industries to Knowledge Production

Malmö is traditionally known as an industrial city. The main economic activity in the city from the beginning of the nineteenth century to the end of the twentieth century was connected to the harbor and shipping industry. The 138-m tall Kockums crane was the symbol of the city and is used for the construction of more than 75 ships, but the shipbuilding industry entered a deep crisis in late 1970s, resulting in increased unemployment in Malmö and a downturn for the whole city. Many people left the city and the population decreased from 265,000 in 1970 to 224,000 in 1990. The crisis worsened through the closure of the cement and car manufacturing industry at the beginning of the 1990s, a period when Sweden as a whole passed through a deep economic recession. The early 1990s was also a period of great instability in many parts of the world. Sweden received large numbers of refugees from Somalia and the former Yugoslavia. Many of the newly arrived were placed in Malmö, as the city had a large amount of empty apartments many of which were owned by the municipality itself through the municipal housing company, Malmö Kommunala Bostäder (MKB). The immigration helped to counteract the population decrease and gave the city the multicultural identity it is well known for today.

Through the later part of the 1990s and onward, the city has struggled to improve its economic situation. An important step in this process was the establishment of Malmö University in 1998. It was built in the Western Harbor area,



Fig. 2.1 The Western Harbor with two landmarks in Malmö then and now: Kockum crane (*left*) and Turning Torso (*right*). *Photo* Malmö Urban Planning Office

where large parts of the former shipbuilding industry had been located (Fig. 2.1). Another important step was the construction of the Öresund-bridge. In 2000, the bridge connecting Malmö to Copenhagen was inaugurated, facilitating both personal travel and transportation of cargo between Sweden and the rest of Europe.

Malmö is today, in many ways, a unique city in Sweden—the closeness to Copenhagen and continental Europe, an increasing multiculturalism and transition from industrial city to knowledge-based city has, over the last few decades, changed the profile of the city as well as the general conception of it held by its inhabitants.

Malmö is also a young city in comparison to many other Swedish cities. In 2011, 30 % of the population was under 25, 33 % 25–44, while 15 % were over 65. The University of Malmö has attracted many students to the city. Also, as a consequence of improved possibilities for commuting, many students from Lund University reside in Malmö.

Thus, over the last few decades, Malmö has changed vastly—both in terms of its economic development, demography, and self-image. This has also had an effect on the solid waste management in the city.

2.2 Waste Management in Malmö

The Establishment for Waste Management (Malmö Renhållningsverk) was founded in 1898 as a department in the municipal structure. The municipal waste department was responsible for both planning of waste management and waste collection/transportation services. By 1992, the department was privatized, as a part of a general privatization wave in Sweden at this time. The collection/

transportation service was sold to a private entrepreneur and the planning section was developed into an ordering organization, placed under the municipal Department for Public Spaces. By 2000, the waste management planning section was transferred to the municipal Department for Water and Wastewater handling. One of the reasons for this was that both wastewater treatment services and solid waste management services are financed by fees, while this is not the case for other activities managed by the Department for Public Spaces (which are tax-financed). By 2008, the Departments for Water and Wastewater handling in Malmö and the neighbor municipality of Lund were merged, creating the municipal enterprise VA SYD. However, the city of Malmö and politicians in the Technical Committee still has the political leadership over the solid waste management sector. As the main argument for the merge of the two municipal departments was to create collaboration in the field of wastewater treatment, the future organization of solid waste management in the City of Malmö is still under discussion. Sysav (South Scania Waste Company) was created in 1974 with the mission to coordinate solid waste management in several municipalities in southern Scania. The company is owned by 14 municipalities, one of them is the City of Malmö. Thus, treatment of municipal solid waste has since then been performed through Sysav.

Thus, both the municipal mission and organization of solid waste management within the City of Malmö have changed over the years, and might also change in the future. In its current form, a Department of Waste Management within VA SYD and has the mission of planning and managing collection and treatment of municipal solid waste which not is covered by producer responsibility ordinances.

In 2011, the amount of residual, garden, and food waste collected in the City of Malmö reached 90,800 tons. Collection and treatment of waste is not performed within the organization. These services are bought from the private sector and performed by an entrepreneur.

In 2009, 75 % of the Swedish municipalities had outsourced collection and transportation of solid waste to private entrepreneurs (Swedish Waste Management Association, 2010). This is the case also in the City of Malmö. However, the municipality still has large potentials of influencing the collection and transportation in these cases. As an example, municipal enterprises are obliged to follow municipal policies related to environmental precaution in all ordering of services and products from external parties. Thus, in the case of Malmö, the municipal policy states that environmental, social, and ethical requirements should be made in all public contracts and that requirements made should aim for long-term sustainable development (City of Malmö, 2012). However, the policy also states that requirements should be proportional, which implies that a balance must be found between high environmental ambitions and an economic reality. Based on this, the municipality has in later years required that collection of waste should be performed in vehicles run on biogas. This is a strategy which does not only decrease environmental burdens related to waste collection, but also stimulates the biogas market through increasing the demand.

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