

INFORMATION NOTE

Waste management policy in Sweden

1. Introduction

1.1 Sweden has established an effective waste management system with only 1% of municipal solid waste ("MSW") ended at landfills in 2011. The treatment of the remaining MSW was characterized by an almost equal share of recycling/composting¹ (48%) and incineration (51%).² In recent years, waste incineration has developed to such level that Sweden has been short of enough feedstock to fuel its incineration plants and started to import waste from its neighbouring countries.

1.2 This information note aims to provide an overview of waste management policy in Sweden, with special reference to thermal incineration treatment technology in terms of its development, energy recovery process, monitoring and enforcement measures, and the extent of public acceptance of the technology in the country.

2. Regulatory framework for waste management policy

Responsible authorities

2.1 The Ministry of the Environment is responsible for formulating national policies on environmental issues and coordinating the government's work on sustainable development. It has established the Swedish Environmental Protection Agency as the central government agency tasked with coordinating and promoting environmental policies and protection, as well as implementing environmental regulations and issuing guidelines for regulation compliance.

¹ Composting means the biological treatment of biodegradable waste resulting in a recoverable product.

² See Eurostat (2014).

2.2 Below the Ministry of the Environment are county administrative boards and municipal executive boards which function as the respective regional and local authorities³ for carrying out inspections and enforcement of environmental laws in Sweden. Local municipalities are also responsible for collecting and treating household waste, and working out their own sanitation plan and regulations for local waste management.

Relevant regulations

2.3 The waste management policy in Sweden is primarily governed by the *Environmental Code* and the *Waste Ordinance*. The *Environmental Code* sets out the framework for promoting sustainable development through the protection of human health and environment as well as effective use of resources. It also contains specific provisions governing waste collection and disposal, resource management, permitting system, supervising authority and penalties for breaching relevant rules. The *Waste Ordinance* complements the *Environmental Code* through setting out general provisions for the regulation of waste management.

2.4 Sweden is also governed by the *Industrial Emissions Directive* issued by the European Union ("EU") which commits its member states to controlling and reducing the impact of industrial emissions on the environment. The Directive is transposed into Swedish law through amending the *Environmental Code* and implementing six new regulations. Among the new regulations, waste incineration is primarily governed by the *Regulation on Waste Incineration*, the *Environmental Regulation* and the *Industrial Emissions Ordinance*.

2.5 The *Regulation on Waste Incineration* sets out the emission limits of pollutants and the corresponding measurement requirements, whereas the *Environmental Regulation* lays down rules on the control, planning and permission requirements for environmental activities such as waste treatment. Meanwhile, the *Industrial Emissions Ordinance* introduces the duty of operators to prepare a baseline report and tightens up the regime of environmental inspections.

³ Sweden is divided into 21 counties on a regional level and the county administrative board is the government body in each county. On a local level, Sweden has 290 municipalities and the municipal executive board leads and coordinates municipality work.

3. Waste treatment in Sweden

3.1 Historically, Sweden has shown strong commitment to environmental protection initiatives and policies, particularly in the area of waste management. Already by 1969, the *Environment Protection Act* imposed far-reaching environmental obligations on new waste treatment facilities.⁴ Several new regulations came into force during the 1990s to provide for increasing importance of producer responsibility and a concentrated effort on measures to reduce landfilling of waste.

3.2 Sweden introduced a landfill tax on 1 January 2000 to discourage the disposal of waste at landfill sites and encourage incineration and recycling. The ensuing increases in taxation level in 2002, 2003 and 2006 instigated a continuous increase in recycling of MSW. The bans on landfilling of sorted combustible waste in 2002 and organic waste in 2005 also lent particular support to the diversion of MSW from landfills.

3.3 Currently, Swedish waste management system is governed by the waste hierarchy enshrined under the EU's *Waste Framework Directive*. It places waste prevention as the priority, followed by re-use, recycling and other recovery (such as waste incineration with energy recovery). The last option for treating waste is disposal without energy recovery like landfilling.

3.4 In addition, Swedish waste management is characterized by a clear division of responsibilities for all involved stakeholders. Municipalities are obliged to have a waste management plan and bear the responsibility of collecting and disposing household waste, except for the product categories covered by producer responsibility. Municipalities may issue local regulations regarding the management of household waste. Households are responsible for separating and depositing waste at the various available collection points maintained by the municipalities. Lastly, producers are obliged to take care of waste arising from their products. They bear producer responsibility for end-of-life packaging, cars, tyres, recycled paper, batteries and electrical and electronic products.

⁴ The *Environment Protection Act* was replaced by the *Environmental Code* in 1999, which integrates 15 previously existing environmental laws and forms an umbrella legislation governing all environmental impacts within the framework of a sound sustainable development for Sweden.

4. Development of thermal waste incineration

4.1 Sweden has a long history of producing energy from waste through incineration, which is currently the major thermal waste treatment technology adopted for treatment of MSW. Other thermal waste treatment technologies, such as pyrolysis and gasification, are rarely adopted in Sweden due to the concerns over the limited track record on treating MSW and the energy efficiency of the process.⁵

4.2 In Sweden, the first waste incineration plant with energy recovery came on stream in 1904. In the late 1940s following World War II, Sweden began to significantly expand its district-heating network which provided outlets for heat produced by the waste-to-energy incineration plants in the ensuing decades. In the 1970s, Sweden's heavy dependency on oil left it extremely vulnerable to the 1973 oil crisis. In response, Sweden embarked on a major expansion of waste-to-energy incineration plants, as well as introducing nuclear to its energy mix and reintroducing coal to reduce the reliance on oil.

4.3 In 1985, the growing concerns over the emission of dioxin from waste incineration resulted in the implementation of a moratorium on building new incineration plants. Following an extensive government review, the moratorium was lifted in 1986 and waste incineration was deemed acceptable from an environmental standpoint provided that more stringent requirements were fulfilled. A number of new environmental requirements were subsequently introduced to prevent the discharge of dioxin, heavy metals and other pollutants from incineration plants. As a result, 20 of the 27 existing plants were rebuilt to improve incineration, and fitted with what were then highly advanced flue-gas treatment systems. The other seven plants were closed for environmental and economic reasons.

⁵ Global View of Waste Management by Antonis Mavropoulos (2012).

4.4 Against the above development, the incineration process has become a cleaner and greener alternative since the mid-1980s, with most harmful byproducts of the process destroyed. A couple of favourable developments in the first half of the 2000s have further boosted incineration as the most common waste management option in Sweden. In 2000, the introduction of a landfill tax played a vital role in the diversion of MSW from landfill in favour of recycling and incineration. Then came the landfill bans on sorted combustible waste in 2002 and all organic waste in 2005.

4.5 In 2006, the Swedish government introduced an incineration tax on household waste in order to boost recycling. The new tax led to higher incineration gate fees charged by plant operators and affected the amount of MSW handled by incineration. The incineration tax was finally abolished in 2010. Since then, incineration has gradually picked up its share of waste handled and accounted for 2.2 million tonnes or 51% of MSW treated in 2011.⁶

4.6 In recent years, Sweden saw an increase in incineration capacity with the start-up of new plants and capacity expansion at existing plants. At present, it has 33 incineration plants with an incineration capacity of handling about 6 million tonnes per year. However, Sweden is producing less burnable waste than it needs for fueling the incineration plants as waste conscious Swedes have been recycling so efficiently. In order to meet the feedstock requirements for its incineration plants, Sweden recently started importing about 800 000 tonnes of waste from European nations annually. A high volume of waste comes from neighbouring Norway where exporting waste is cheaper than burning it. Norway pays Sweden to import the waste for incineration, while the ash – laced with heavy metals and other pollutants – is sent back to Norway for effective management.

⁶ See Eurostat (2014).

Energy recovery

4.7 In Sweden, all waste incineration plants can produce energy in the form of electricity and/or heat. The generated heat is distributed through district heating grids to supply cities with heat and hot water, and the electricity generated is sold on the power market. To achieve the highest efficiency, a number of plants adopt combined heat and power ("CHP") applications to produce both heat and electricity simultaneously. With well-developed district heating network, the sale of heat is the largest and most dependable revenue stream for Swedish CHP plants.

4.8 In 2012, at least 14.7 terawatt hours ("TWh")⁷ of energy was produced through waste incineration, of which 13TWh was used for heating, corresponding to the heat for about 810 000 households or about 20% of heat produced by the district-heating systems.⁸ Another 1.7 TWh was used for production of electricity, corresponding to the needs of almost 250 000 homes.

Monitoring and enforcement measures

Environmental permit

4.9 Waste incineration plants burning hazardous waste or non-hazardous waste of more than 50 tonnes per year are statutorily required to have environmental permits for operation. Other incineration plants which operate with an input power of more than 20MW are also subject to the permitting requirement. The environmental permit sets out the terms regulating the environmental impact of a permitted facility such as the permissible amount of pollutants that can be emitted. It is issued by the county administrative boards or the Land and Environmental Court, depending on the type and quantity of the waste treated.⁹

⁷ Terawatt hour is a unit of energy used for calculating the quantity of electrical or heating energy.

⁸ See Avfall Sverige (2013b).

⁹ Incineration plants handling "type A-activities", such as treating hazardous waste for more than 2 500 tonnes, are required to obtain a permit issued by the Land and Environmental Court. Those handling "type B-activities", such as treating hazardous waste for less than 2 500 tonnes, require permit from the country administrative boards.

4.10 Application for an environmental permit must be accompanied by an environmental impact report for the proposed waste incineration plant. The report is submitted to the relevant permit issuing authority, which will carry out investigations and solicit views from key stakeholders such as the municipal environmental council and local residents.

Notification

4.11 An incineration plant burning less than 50 tonnes of non-hazardous waste per year or having an input power of less than 20MW is exempted from the permitting requirement. However, the plant operator still needs to provide a notification to the relevant municipal regulatory authority, which may order the implementation of measures to alleviate or prevent the health and environment impacts of waste incineration.

Self-monitoring and reporting

4.12 To enforce the compliance with the statutory requirements for waste incineration plants, it is mandatory for plant operators to establish a self-monitoring system. Plant operators are also required to submit to the county administrative boards an annual environmental report which contains a statement describing the measures taken to comply with the permit conditions and the effectiveness of these measures.

Penalty

4.13 According to the *Environmental Code*, any operators of waste incineration plants creating pollution that is significantly harmful to human health, animal or plant, or cause serious harm to the environment, may be convicted for environmental crime and liable to a fine and/or imprisonment.

Public acceptance of waste incineration

4.14 Waste incineration is widely accepted in Sweden. Some incineration plants are also located close to the residential area or city centre. For example, the Högdalen plant and a number of secondary installations, which provide most of the energy required to heat the capital Stockholm, are situated nearby the residential areas.¹⁰ In Göteborg, the second largest city in Sweden, the Sävenäs plant is close to the city centre and highly visible from the highway that leads the traffic into the city.¹¹ While waste incineration is highly acceptable among the public, most Swedes still prefer recycling to waste incineration as a waste disposal method.

Prepared by Shirley TAM
26 February 2014
Tel: 2871 2146

Information notes are compiled for Members and Committees of the Legislative Council. They are not legal or other professional advice and shall not be relied on as such. Information notes are subject to copyright owned by The Legislative Council Commission (The Commission). The Commission permits accurate reproduction of information notes for non-commercial use in a manner not adversely affecting the Legislative Council, provided that acknowledgement is made stating the Research Office of the Legislative Council Secretariat as the source and one copy of the reproduction is sent to the Legislative Council Library.

¹⁰ Presseurop (2011).

¹¹ University of Gothenburg (2013).

References

1. American Council on Renewable Energy. (2011) *Waste-to-Energy Success Factors in Sweden and the United States*. Available from: <http://www.acore.org/wp-content/uploads/2012/04/WTE-in-Sweden-and-the-US-Matt-Williams..pdf> [Accessed February 2014].
2. Avfall Sverige. (2013a) *Kapacitetsutredning 2013 – avfallsförbränning till år 2020*. Available from: <http://www.avfallsverige.se/fileadmin/uploads/Rapporter/Förbränning/E2013-04.pdf> [Accessed February 2014].
3. Avfall Sverige. (2013b) *Swedish Waste Management*. Available from: http://www.avfallsverige.se/fileadmin/uploads/Rapporter/SWM_2013.pdf [Accessed February 2014].
4. Avfall Sverige. (undated) *Towards a greener future with Swedish waste-to-energy: The world's best example*. Available from: http://www.avfallsverige.se/fileadmin/uploads/forbranning_eng.pdf [Accessed February 2014].
5. Chamber Trade Sweden. (2013) *Greentech the Swedish Experience & Expertise*. Available from: [http://swedishcleantech.se/Global/PDF/CTS-Greentech-Report%20\(3\).pdf](http://swedishcleantech.se/Global/PDF/CTS-Greentech-Report%20(3).pdf) [Accessed February 2014].
6. Columbia University in the City of New York. (undated) *Summary of the Swedish report "Förbränning av avfall – en kunskapssammanställning om dioxiner" (Waste-to-energy, an inventory and review about dioxins)*. Available from: http://www.seas.columbia.edu/earth/wtert/sofos/DIOXINS_in_SWEDEN.pdf [Accessed February 2014].
7. Delphi. (2013) *To Incorporate a Partly New Environmental Regulation – IED in Swede*. Available from: [http://www.delphi.se/\\$-1/file/artiklar/2013/1306-nobelhamburger-ied-eng.pdf](http://www.delphi.se/$-1/file/artiklar/2013/1306-nobelhamburger-ied-eng.pdf) [Accessed February 2014].
8. European Environment Agency. (2013) *Municipal waste management in Sweden*. Prepared by Leonidas Milios ETC/SCP.

-
9. Eurostat. (2014) *Database: Municipal Waste*. Available from: <http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/database> [Accessed February 2014].
 10. Global View of Waste Management by Antonis Mavropoulos. (2012) *Let's speak about Waste To Energy...* Available from: <http://mavropoulos.blogspot.hk/2012/04/lets-speak-about-waste-to-energy.html> [Accessed February 2014].
 11. Midwest Energy News. (2013) *Is burining garbage green? In Sweden, there's little debate.* Available from: <http://www.midwestenergynews.com/2013/10/17/is-burning-garbage-green-in-sweden-theres-little-debate/> [Accessed February 2014].
 12. Presseurop. (2011) *Europe's happy rubbish collectors*. Available from: <http://www.presseurop.eu/en/content/article/670281-europe-s-happy-rubbish-collectors> [Accessed February 2014].
 13. Ruth Hupart. (2012) *From "Not in My Backyard" to "Why not in my backyard?": Shifting attitudes in Sweden toward incineration*. Available from: <http://ruthhupart.com/2012/07/05/from-not-in-my-backyard-to-why-not-in-my-backyard-shifting-attitudes-in-sweden-toward-incineration/> [Accessed February 2014].
 14. Swedish Environmental Protection Agency. (2009) *Licensing, inspection and enforcement system in Sweden for environmentally hazardous activities*. Available from: <https://www.naturvardsverket.se/Documents/publikationer/978-91-620-8470-7.pdf> [Accessed February 2014].
 15. Swedish Environmental Protection Agency. (2012) *From waste management to resource efficiency: Sweden's Waste Plan 2012–2017*. Available from: <http://www.naturvardsverket.se/Documents/publikationer/978-91-620-6560-7.pdf> [Accessed February 2014].
 16. University of Gothenburg. (2013) *Infrastructures, Lock-in, and Sustainable Urban Development – The Case of Waste Incineration in the Göteborg Metropolitan Areas*. Available from: http://www.ism.lu.se/fileadmin/files/oki/Lock_in_WP.pdf [Accessed February 2014].
-