ZERO WASTE EUROPE

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Waste Incineration getting away with CO2 emissions unscathed

A Lithuanian example could provide the answer by including Waste-to-Energy in the EU ETS

Case Study

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Within the EU, the CO2 emissions from conventional power stations burning fossil fuels are regulated by the EU Emissions Trading Scheme (EU ETS[1]). However, plants that are used to incinerate Municipal Solid Waste (MSW) with energy recovery[2] are not included in the scope of the EU ETS[3], meaning that a large number of high CO2 emitting facilities are not accountable for their greenhouse gas emissions [4]. Article 24 of the EU ETS Directive allows Member States to voluntarily include waste incineration plants (among others) under the scope of the EU ETS.

This paper uses the example of the "Fortum Klaipeda" waste co-incineration plant in Lithuania to illustrate how waste incineration plants could be included under the EU ETS at EU or national level and outlines at the potential impact such inclusion on driving better waste management in Europe.

Growing impact of waste incineration on climate

Increasing quantities of MSW are incinerated for energy generation in Europe with between 0.7 and 1.7 tonnes of CO2[5] generated by burning of 1 tonne of MSW. The latest data from Eurostat show that approximately 70 million tonnes of MSW were incinerated in 2017, 118% more than in 1995[6]. This equates to between 49 and 119 million tonnes of CO2 released by MSW incinerators in 2017.

A number of recent reports[7] and policy strategies[8] contain warnings on the impact of waste incineration on climate. Yet, waste incinerators are not part of the EU ETS nor are they subject to any similar scheme to progressively reduce carbon emissions or to factor-in the carbon cost of burning fossil fuel[9]. This means that **a large number of facilities[10] are creating CO2 emissions without compensating for the damage done[11]**.

[1] European Commission, 2010. Available at ec.europa.eu/clima/policies/ets_en
[2] Guidelines on the interpretation of the R1 energy efficiency formula for incineration facilities dedicated to the processing of municipal solid waste according to the Annex II of Directive 2008/98/EC on waste.
Available at: ec.europa.eu/environment/waste/framework/pdf/guidance.pdf
[3] European Commission, 2010. Available at: ec.europa.eu/clima/sites/clima/files/ets/docs/guidance_interpretation_en.pdf
[4] Zero Waste Europe, 2019. Available at: zerowasteeurope.eu/2019/09/waste-to-energy-is-not-sustainable/
[5] Pollution inventory reporting –incineration activities guidance note. Available at:
assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/296988/LIT_7757_9e97eb.pdf
[6] UNEP, 2019, Waste to Energy: Considerations for Informed Decision-making.
Available at: wedocs.unep.org/handle/20.500.11822/28413?show=full
[7] For example, Plastic & Climate: The Hidden Costs of a Plastic Planet estimates that in 2019, the production and incineration of plastic will produce more than 850 million metric tonnes of greenhouse gases—equal to the emissions from 189 five-hundred-megawatt coal power plants. Available at: ciel.org/wp-content/uploads/2019/05/Plastic-and-Climate-FINAL-2019.pdf
[8] For example, A European Strategy for Plastics in A Circular Economy estimates that plastics production and incineration of plastic waste give rise to approximately 400 million tonnes of CO2 globally each year.
Available at: ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf
[9] Guidance on Interpretation of Annex I of the EU ETS Directive (excluding aviation activities).
Available at: ec.europa.eu/clima/sites/clima/files/ets/docs/guidance_interpretation_en.pdf
[10] Eurostat estimates that there are 3,384 incineration facilities with energy recovery in the EU 28.
Available at: appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasfac&lang=en
[11] The 'polluter-pays principle' is a fundamental tenet of environmental pricing policy to ensure that damage inflicted by an activity is reflected in the cost of doing business. Carbon pricing is the implementation of the polluter pays principle for greenhouse gases, usually in the form of a carbon tax or a requirement to purchase permits to pollute, commonly referred to as a cap and trade or ETS.
Available at: carbonmarketwatch.org/our-work/carbon-pricing

Fortum Klaipėda co-incineration plant

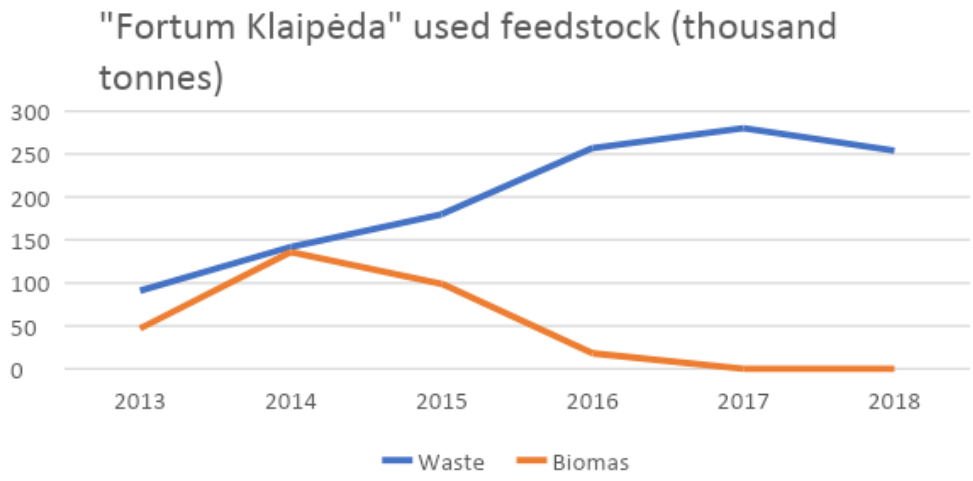
"Fortum Klaipėda" is a waste co-incineration plant[12] located in the territory of Klaipeda, a coastal industrial town in west Lithuania. This plant is part of the Finnish energy giant "Fortum Oyj". It opened in May 2013 and currently incinerates about 250,000 tonnes[13] of municipal and industrial waste per year. At present, it remains the only waste incineration plant in Lithuania, although two other facilities are under construction (in Kaunas and Vilnius) and are due to come on stream in December 2019 and June 2020 respectively[14].

Figure 1. "Fortum Klaipėda" waste incineration plant from bird's view. Source: "Fortum Klaipėda"

"Fortum Klaipėda" has a total incineration capacity of 255,000 tonnes[15]. It was initially allowed to incinerate just 125 000 tonnes of local (Klaipeda region) MSW per year, with the remainder being woody biomass. However, at the end of 2014[16] the plant received permission to start incinerating non-hazardous municipal and industrial waste from other Lithuanian regions, and to increase the quantity of incinerated waste to 180,000 tonnes/year. Since 2017, "Fortum Klaipeda" burns solely municipal and industrial wastes. This change in feedstock[17] saw "Fortum Klaipėda" included into EU ETS system in the end of 2016[18].

[12] A "Co-incineration plant" is any stationary or mobile plant whose main purpose is the generation of energy or production of material products and that uses wastes as a regular or additional fuel or one in which waste is thermally treated for the purpose of disposal.
[13] Verslo Žinios, 2018. Available at: vz.lt/energetika/2018/03/05/fortum-klaipeda-pernai-kureno-vien-tik-atliekas
[14] 15min, 2019. Available at: 15min.lt/verslas/naujiena/energetika/kaune-atlieku-jegaine-uzsikurs-jau-gruodi-vilniuje-kitamet-birzeli-664-1204234
[15] Lithuanian Environment Agency, 2014. Available at: gamta.lt/files/2014-06-23_galutine%20atrankos%20isvada%20del%20Fortum%20Klaipeda.pdf
[16] Fortum Klaipėda, 2015.
Available at: fortum.lt/media/2014/11/fortum-klaipeda-leista-kurui-naudoti-atliekas-kitu-lietuvos-regionu
[17] According to Waste Incineration Law Fortum Klaipeda is considered as "co-incineration facility" and not a waste incineration facility. This is because the main purpose of the facility is to sell heat and power and incinerate various feedstock (not only MSW).
Available at: e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.207966/asr
[18] European Commission. Available at: ec-europe-climate

Figure 2. "Fortum Klaipėda" used feedstock. (Source: "Fortum Heat Lithuania" and Aplinkos Apsaugos Agentūra)



Determining CO2 emissions at Fortum Klaipėda

MSW is a heterogeneous waste stream consisting of materials of biogenic (e.g. paper, cardboard) and fossil origin (e.g. plastic) produced by households and other sources similar in nature and composition to household waste (such as commercial waste). This presents a certain challenge to monitor the emissions of fossil fraction/percentage of CO2 released by burning waste.

To ensure its effective operations, the EU ETS requires the monitoring and reporting of greenhouse gas emissions to be robust, transparent, consistent and accurate[19]. "Fortum Klaipėda" measures its CO2 emissions through the continuous CO2 concentration monitoring method[20], which are verified once a year by an external auditor[21].

The measurement of CO2 emissions (Table 1) of Fortum Klaipeda shows that the emissions fluctuate according to the volume and type (municipal and industrial waste) of waste incinerated. In 2018, "Fortum Klaipeda" released 277,377[22] tonnes of CO2, of which 131,976 tonnes were biogenic and

[19] Monitoring, reporting and verification of EU ETS emissions.
Available at: ec.europa.eu/clima/policies/ets/monitoring_en

[20] According to a personal communication with the Lithuanian Environment Agency on December 5th 2019, "CO2, CO and H2O concentrations in stack emissions are measured by constant emission measuring system. Emission quantity is measured by constant flow measuring device. The measuring system automatically calculates the hourly CO2 and CO concentration (mg/nm3) and hourly gas quantity (nm3), using set calibration coefficients and H2O quantity in emissions. Annual CO2 and CO quantities are calculated using SAR VIII annex 1 formula. Yearly CO2 quantity is recalculated to CO2 by multiplying molar mass relation 44/28 (1.57). To measure GHG from biomass at least once a week a sample of emissions is taken and sent to accredited laboratory. Laboratory calculates biogenic origin carbon part in emissions according to ASTM D6866-16B method. Annual biomass GHG are calculated using average of all lab. results. Previously, it used to measure the emissions through waste composition analysis by physically measuring the waste structure.

[21] Key statement of the independent reasonable assurance report verification report. Emission Trading Scheme.
Available at: klimatas.gamta.lt/files/02-VR%20P3_COM__Fortum%20Klaipeda_2018_lt.pdf

[22] "Fortum Klaipėda", 2019. Available at: klimatas.gamta.lt/files/Fortum%20Klaipeda%20SESD%20ataskaita%202018.xls

145,401 tonnes of fossil origin[23]. **The latter is equal to the annual emissions of 31,608 passenger cars[24]**.

Table 1. Fossil fuel CO2 emissions and feedstock during the period 2016-2019. (Source: European Union Transaction Log and Aplinkos Apsaugos Agentūra)

Year	CO2 verified (tonnes)	CO2 allocated* (tonnes)	CO2 purchased (tonnes)	Municipal waste (tonnes)	Industrial waste (tonnes)
2016	29957,00	13992	15965	174299.2	82671.6
2017	134653	57923	76730	200780.1	79278.2
2018	145401	48948	96453	153150.7	103673.3
2019	No data yet	40264	No data yet	No data yet	No data yet

** Emission allowances are allocated according to the EU ETS[25].*

The impact of inclusion in the EU ETS

In recent years, the price of ETS allowances has increased significantly (see Figure 3), which is starting to affect the cost of operations. For example, in 2018, the plant paid €2,58 million for the 96,453 tonnes of CO2 emitted. As a result, the management of "Fortum Klaipeda" announced[26] that it may need to increase the gate fee (paid by municipalities and companies to burn their waste)[27] to cover the increased costs of ETS allowances. This would be a positive development as the current incineration gate fee (€33-34/tonne[28], but can vary depending on region) imposed on municipalities is less than half of that for landfilling (which is around €45-75/tonne[29], including €5/tonne landfill tax[30]). The low gate fee has not incentivised municipalities to improve their waste collection schemes to divert waste from incineration to recycling. Today most of municipal solid waste in the Klaipeda region is incinerated (62%), about 7.5% is landfilled and only 15.2% is composted[31]. Matching the costs to those of landfilling would not only encourage municipalities to improve their waste collection practices but eventually lower CO2 emissions.

[23] UAB DNV GL Lietuva, 2019. Available at: klimatas.gamta.lt/files/02-VR%20P3_COM__Fortum%20Klaipeda_2018_lt.pdf
[24] A typical passenger vehicle emits about 4.6 metric tonnes of carbon dioxide per year. Available at: epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
[25] European Commission. Available at: ec.europa.eu/clima/policies/ets/allowances_en#tab-0-3
[26] Atvira Klaipėda, 2019. Available at: atviraklaipeda.lt/2019/10/11/fortum-klaipeda-atlieku-tvarkymas-gali-pabrangti/
[27] A gate fee (or tipping fee) is the charge levied upon a given quantity of waste received at a waste processing facility.
[28] Based on the contract award. Available at: cvpp.lt/download.php?dok_id=2004026587&file_id=2004026588
[29] Landfilling costs vary by region.
[30] Landfill tax is regulated by the Law on Environmental Pollution Charge.
Available at: e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.80721/asr
[31] Municipal Waste Management 2018.
Available at: slideshare.net/LRATCA/komunaliniu-atlieku-tvarkymas-2018-m?from_action=save

Figure 3. CO2 European Emission Allowances prices (Source: Business Insider)

Conclusion and recommendations

Evidence shows that municipal waste incineration has a growing negative impact on climate, yet because they are not part of the EU-ETS or any similar scheme to progressively reduce CO2 emissions, these incinerators are not compensating for the resulting climate damage. The case of "Fortum Klaipeda" shows that MSW incinerators can contribute to the objectives of the EU ETS, as well as, driving better waste management.

Zero Waste Europe strongly recommends that MSW incinerators should be included in the upcoming review of the EU ETS. In addition, to ensure that the monitoring of CO2 emissions is robust, we recommend measuring the stack emissions in the manner described above, using the continuous emission monitoring method.

However, to ensure that the CO2 emissions measured are representative of the feedstock, Zero Waste Europe also recommends that the stack emissions monitoring is combined with the waste composition analysis. This latter allows consideration changes in waste composition due to either feedstock (e.g. more biogenic materials such as garden waste during certain seasons) or waste collection practices (e.g. introduction of separate collection of biowaste from 2023). The compositions analysis should be performed at least four times a year to capture changes in waste composition. The results of the analysis should be made publicly available. This would allow to determine what is being incinerated and to assess how much of it were recyclable or reusable, giving decision makers the chance to implement new strategies to recover those materials.

Case study by VšĮ "Žiedinė ekonomika"

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VšĮ "Žiedinė ekonomika" is a NGO established in 2016 to promote a zero waste philosophy and circular economy practices in Lithuania, and is part of Zero Waste Europe's network. VšĮ "Žiedinė ekonomika works closely with municipalities, the national government, companies and schools, runs educational programmes, and shares best practices.

Zero Waste Europe is the European network of communities, local leaders, businesses, experts, and change agents working towards the same vision: phasing out waste from our society. We empower communities to redesign their relationship with resources, to adopt smarter lifestyles and sustainable consumption patterns and think circular.

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