

CEWEP Country Report 2016

Sweden



"Municipal Waste" (MW) means waste from households as well as commercial, industrial and institutional waste, which because of its nature and composition is similar to waste from households (excluding hazardous waste).

"Solid Recovered Fuels" (SRF):- solid fuel prepared from non-hazardous waste to be utilised for energy recovery in incineration or co-incineration plants, and meeting the classification and specification requirements laid down in CEN/TS W100343003.

"Refuse Derived Fuels" (RDF): broader than definition of SRF. In the Country Report only RDF expression is used and it comprises SRF as well.

A. Amount of Waste

In your <u>country</u> **	Year 2014*	In million tonnes
Total amount of Municipal Waste (MW): MW production / inhabitant / year: 466.5 kg/inhabitant		
Total amount of household waste	2014	4.54716
Total amount of commercial/industrial/institutional waste similar to household waste	2014	***
Total amount of industrial/commercial waste	2014	No data available****
Total amount of waste	2014	No data available****

*Avfall Sverige can provide with 2015 in April.

**Cement kilns and other material manufacturing units as well as Söderenergi AB excluded above.

***There are no separate data on similar waste. Waste from households and similar commercial, industrial and institutional waste is included in the total amount of MW.

****Newest data on total amount of generated waste is from 2012 (152 Mtonnes). Most of the generated waste in Sweden 2012 came from the mining industry (129 Mtonnes), building industry (7.7 Mtonnes), households (4.2 Mtonnes) and pulp and paper (1.8 Mtonnes).

<https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6619-2.pdf?pid=13196>

B. Treatment of Waste

In your <u>country</u> (concerning MW)	%	Year 2014	In million tonnes
Recycling (including composting and biogas/ bio fertiliser production)	52 (16.4)	2014	2.36562 (0.74769)
Incineration (all are R1)	47.3	2014	2.14864
Landfilling	0.7	2014	0.0329

Total Amount of thermally treated waste in million tonnes	Country 2014	Organisation/ company
In WtE plants/dedicated RDF plants****	5.69768	
In Cement kilns	Approx. 0.15*****	

***** Data only refers to waste (both MS and industrial) treated in plants incinerating MS or more than 40% hazardous waste. Data does not include waste incinerated in traditional co-incinerators. Data on total waste incinerated is only available for 2012: 5.9 Mtonnes.

<https://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6619-2.pdf?pid=13196>

***** <http://www.avfallsverige.se/medlemmar/rapporter/rapporter-2015/201514/>

Number of	Country	Organisation/ company
	2014	
WtE plants	33	
Dedicated RDF plants	-	
R1 plants	All of the above	

Capacity development in your <u>country</u>	Years			
	2017 – 2020		2021 – 2025	
	Additional Capacity, ktonnes	Additional number of plants	Additional Capacity, ktonnes	Additional number of plants
Planned Waste-to-Energy plants:	50	1		
Planned RDF plants:				
All (if it is not possible to specify separately)				
2014-2016: 300 kton of new capacity. 2016: approx. 6.2 Mtonne capacity in total. Additional capacity of 50 ktonne corresponds to Nybro Energi plant. There are more planned capacity, but not yet (2016-03-08) with permits (both new and existing plants, expanded cap.).				

C. Energy production in Waste-to-Energy and dedicated RDF plants

1. Total Electricity and Heat production in Waste-to-Energy and dedicated RDF plants

Reference year: 2014 (if data from 2015 are available, please add them and specify the year)

Total Electricity and Heat production*****	Waste-to-Energy plants and dedicated RDF plants	
	Country	Organisation/company
Reference amount of thermally treated waste in million tonnes:	2014: 5.69768	
Number of plants:	2014: 33	
Electricity produced in million MWh/ year	2014: 2.0 million MWh	
Electricity exported in million MWh/ year	2014: 1.416495 million MWh	
Heat* produced in million MWh/ year	2014: 14.6 million MWh	
Heat* exported in million MWh/ year	2014: 14.6 million MWh	

* incl. heating, cooling and steam

***** **Electricity:** Since all plants have reported produced electricity in our database, a calculation using 0,106 MWh_{electricity}/tonne self usage for CHP (from Energy Eff. Report III) was used. In 2014, 6 plants produce heat only (hence 193 ktonnes waste excluded in the recalculation from produced to exported electricity). (2014: 5 504

768 tonne x 0.106 MWh = 583 505 MWh to be subtracted from produced → equals:) **Heat**: All have reported exported values. Difference between exported and produced are negligible.

2. Recognition of energy produced in Waste-to-Energy and RDF plants as renewable
 “Recognition” is somewhat hard to refer to. The National Inventory Report data (NIR-data) suggests 64% is biogenic of the waste input. This is based on studies by Avfall Sverige. The emission factors (used by plants emitting less than 50 ktonnes of CO₂ annually – EU-ETS), under Article 31.1 c in regulation EU/601/2012, are based on the same studies by Avfall Sverige (emissions factors as below). Most bigger plants measure CO₂ in the stack and analyse the results per biogenic and fossil part back to the incoming waste. Unfortunately, both NIR-data and emission factors under Art. 31.1 c (EU/601/2012) are not updated. Results from measuring 2015 (with background C₁₄/C₁₂, pMC=105) show a mean biogenic part of 60%. But with lower background value, which could be argued to be used, the biogenic part increases.

<https://www.naturvardsverket.se/upload/sa-mar-miljon/statistik-a-till-o/vaxthusgaser/2015/rapport-nir-2015-preliminar.pdf>

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according to article 31.1 c i Commission regulation (EU) 601/2012

Date of publishing Nov 8, 2012

	Household waste	Industrial waste
Biomass fraction	0,69	0,62
Fossil fraction	0,31	0,38
Heating value as delivered (TJ/Gg) = (GJ/ton)	9,64	11,7
Preliminary emission factor (ton total CO ₂ /TJ fuel)	98,3	96,2
Emission factor (ton fossil CO ₂ /TJ fuel)	30,2	36,8

How much %? (Please indicate if it refers to energy production or waste input): 64 % of C-content in the waste input is renewable (according to NIR-data)

Contribution of WtE to the production of renewable energy in your country (%) ≈ 5.2 %

If energy production from food waste, other than energy recovery in WtE plants (AD), is included: ≈ 5.5%

Reneable Energy Production (WtE)*	Total Renewable Energy Production	TWh	Quota Renewable Energy from WtE of tot Renewable Energy production
	Heat + Electricity (TWh)		
Electricity (TWh)	1,28	Wind 6 Hydro 67 Biofuels (peat, traditional biofuels and waste included) 132	5,18244%
Heat (TWh)	9,344		
tot	10,624	tot 577 RE 205 %	36%
RE in waste:	0,64		

Source: Energiläget 2015, Swedish Energy Agency
<https://energimyndigheten.a-w2m.se/Home.mvc?ResourceId=5521>

(There are no data for 2014 (newest from 2013), hence the share is approximative.

Incl. Energy production from separately collected food waste: (source: Swedish Waste Management 2015)

0,66557

5,50711%

Source: Energiläget 2015, Swedish Energy Agency

<https://energimyndigheten.a-w2m.se/Home.mvc?ResourceId=5521>

In your <u>country</u>	Electricity 2014	Heat 2014
Market price per kWh in €cent/kWh	SE1: 3.142 SE2: 3.142 SE3: 3.162 SE4: 3.191	9.04
Subsidy or market based instruments (Please specify e.g. green certificates, feed in tariffs)	Not for residual waste (but for separately collected mono streams of waste, peat and other biofuels)	Not for residual waste
Price incl. subsidy or market based instruments in €cent/kWh	-	-

Electricity price:

<http://www.nordpoolspot.com/Market-data1/Elspot/Area-Prices/SE/Yearly/?view=table>

Heat price:

<http://www.svenskfjarrvarme.se/Statistik--Pris/Fjarrvarmepriser/>

0.825 SEK/kWh (average 2014)

9.125 SEK/ EUR (average 2014) → 9.04 €cent/ kWh

D. Residues

Reference year: 2014 (if data from 2015 are available, please add them and specify the year)

Slag/bottom ash	Country	Organisation/
Annual amount in million tonnes:	0.95377	
Method of utilisation or disposal (%): (road construction, cement production, construction block fabrication, landfill)	Close to 100% as construction Our data is not yet reliable since operators do not completely differ landfill from construction on landfill. Almost none as construction other than on site.	
Recovery of metals: • Annual amount (%): • Ferrous (F) material extracted (gross weight, %):	≈7.11 weight-%	

<ul style="list-style-type: none"> • Non Ferrous (NF) material extracted (gross weight, %): • Typical composition of the NF fraction (% Al, other NF, inert): 	(recovered metals/ generated bottom ash), of which: F: ≈5.33 weight-% NF: ≈1.74 weight-%	
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Not all plants have reported. Concerning F-metals: only 15 plants reported data, with a total slag production of ≈493 190 tonnes in 2014. Concerning NF-metals: only 8 plants reported data, with a total slag production of ≈268 115 tonnes in 2014. Based on 16.7% slag/ bottom ash production per waste weight input from 2014-data (Avfall Sverige, Avfall Web).

F: 26 319 tonnes F-metals/ 493 190 tonnes slag ≈ 5.33%

NF: 4 668 tonnes NF-metals/ 268 115 tonnes of slag ≈ 1.74%

FGC (Flue Gas Cleaning) residues, (incl. filter dust and boiler ash)	Country 2014	Organisation/company
Annual amount in million tonnes:	0.25058	
Method of treatment or disposal (e.g. stabilisation, salt mine, hazardous landfill site):	Stabilisation (main part) Hazardous landfill site (some) No exact data.	

E. Export and Import of MUNICIPAL and SIMILAR WASTE

Into/from your country, reference year: 2014 (if data from 2015 are available, please add them and specify)

	MSW	RDF
Export	No data	No data
Import	≈700 000 tonnes	≈700 000 tonnes

MSW from Norway (≈50% of the imported waste for ER) and from UK+Ireland (≈50% of the imported waste for ER in WtE plants). ≈0.3 Mtonnes were exported in 2014 but no data available to what kind of treatment.

F. Responsibilities Public - Private

Type of waste:	Responsibility for treatment: Public/Private	Responsibility for collection and transport: Public/Private	Municipalities' responsibility for monitoring: Yes/No
from private households	Residual and food waste: Public Packaging and paper: Private	Residual and food waste: Public Packaging and paper: Private (potential change to public).	yes

commercial waste similar to household waste	Residual and food waste: Public Packaging and paper: Private/ open	Public	yes
Non hazardous industrial/commercial waste (not similar)	Private/ open market	Private/ open market	no
hazardous waste	Public	Public	yes

G. Refuse Derived Fuels (RDF)

In your country, reference year: 2014

1. **Amount of RDF/year**
 - a. **Current Production:** 6 770 tonnes (from KSRR central sorting facility to Cementa)
 - b. **Potential:** -
2. **Experience (market development etc.):** Only a few central sorting facilities (2) and not a trend in Sweden (yet).
3. **Capacity for mechanical-biological treatment/ year**

Currently: -

Planned: -

H. Prices and taxes

1. Waste-to-Energy prices for Municipal Waste (MW)

Reference year: 2014

Average Net fee in €/tonne (only SE MW, public procurement)	VAT (Value Added Tax) rate %
51.65	

	Tax in €/tonne MW	Tax for export in €/tonne MW	Tax for import in €/tonne MW	Rules to avoid double taxation if MS of destination and of dispatch have taxes	Comments
Incineration					
Co-Incineration					

Waste-to-Energy total price in €/tonne MW _____

2. Landfill taxes and bans

Reference year: _____

Average Net fee for landfilling in €/tonne	VAT (Value Added Tax) rate %	Landfill tax in €/tonne (If landfill tax is planned please indicate when and the amount planned)	Total price for landfilling €/tonne MW	Landfill ban (If landfill ban is planned please indicate when and for what type of waste)
93.41		47.8 (435 SEK/tonne)		Ban on organic (2005) and combustible waste (2002)

Since 1 Jan, 2015: Landfill tax of 500 SEK/tonne

I. Investment

1. The average investment cost per tonne of annual capacity (for a new plant, considering 15-20 years operation):
2. Investment cost regarding flue gas cleaning system (% of total investment):
3. The average investment cost per MW heat and electricity installed respectively:

J. Employment

The amount of employment created by the Waste-to-Energy industry

Jobs (full time equivalent) per WtE plant including operation process, administration and outsourced personnel hired on regular basis i.e. during maintenance (reference to total capacity): _____

You can also provide this information in another unit, e.g. jobs per 100,000 t/a capacity