



Waste to Energy Kristianstad, Sweden

Kristianstad is the capital of the Swedish province Skåne and the nucleus of the north east Skåne. About 81 000 people live in the municipal area. The Kristianstad Region has some of the best agricultural land in Europe. Good farming conditions, a high level of mechanisation, a good environment and specialised investment in research and development have made Kristianstad into one of the major food centres of Sweden.



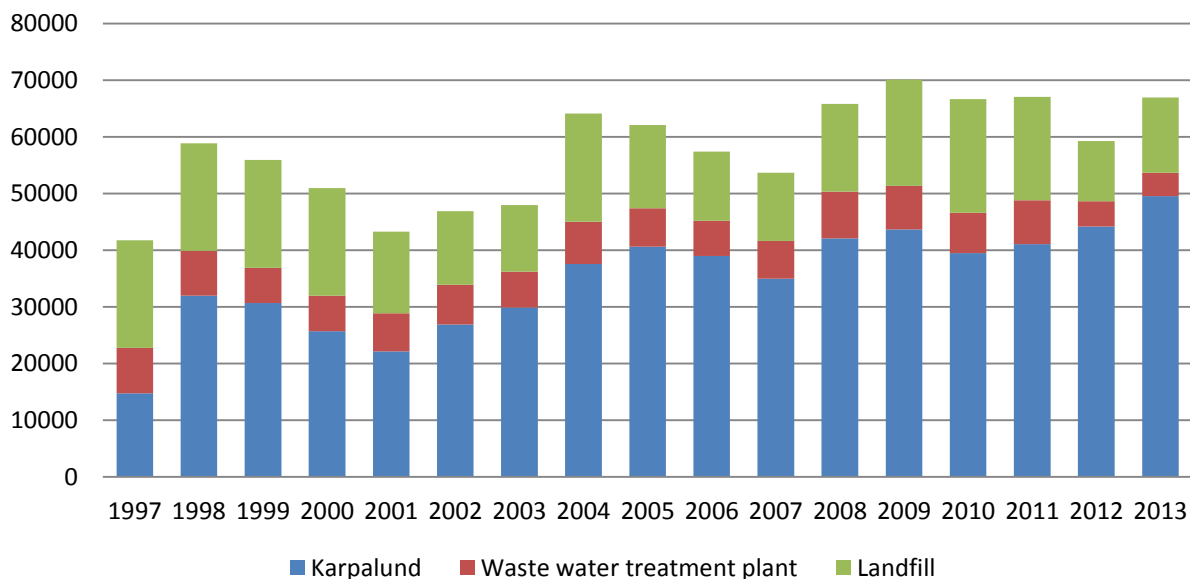
Waste management is closely related to energy and climate issues since waste can both generate greenhouse gas emissions and reduce them when used as a bio fuel. The large agricultural sector in Kristianstad generates considerable amounts of manure and the food industry produces lots of organic waste. In Kristianstad digestion of organic matter into biogas has become the most important way to reduce the negative environmental impacts of waste and instead use it as an energy resource. Recycling is also an important part of waste management in Kristianstad and material that neither can be recycled nor digested is to a large extent incinerated with energy extraction.

Biogas production

Biogas is produced at three different locations in Kristianstad:

- The Landfill
- The Waste Water Treatment plant
- The Biogas plant in Karpalund

Biogasproduction MWh/year



Biogas from the landfill

Landfills are the second greatest methane source in Sweden after agriculture. Collecting the gas and use it for energy production is therefore very important. The gas from the landfill in Kristianstad is used for incineration in the combined heat and power plant. The collection of biogas from the landfill prevents huge amounts of methane to enter the atmosphere and instead it can be used as a biofuel and thereby reduce the use of oil. The prevention of methane loss is equivalent to 53,000 tonnes of carbon dioxide (in a perspective of 20 years) and the substitution of oil with biogas means that an additional 4,000 tons of carbon dioxide are saved.

Biogas from the waste water treatment plant

Every day about 250 m³ of sludge is pumped to the reactors. The biogas produced each year contains the equivalent of approximately 7 000 MWh (= 700 000 liters of diesel). About half of the biogas is used to heat the plant. The remainder is purified from carbon dioxide and hydrogen sulfide and sold as vehicle fuel. This gas (3000 MWh), is enough to power about 10 buses or 300 cars. The digested sludge is centrifuged and the liquid disappears. The treatment plant delivers out annually approximately 11 000 tons of sludge with a dry substance of 20%. (ds 20).

Biogas from the plant in Karpalund

In 1997 the local Municipal Waste Management Company established the biogas plant in Karpalund, primarily as a treatment plant for waste from the food industry in Kristianstad. The Karpalund plant was the first in Sweden to co-digest municipal solid waste from households (sorted into paper bags) and food industry together with manure for production of useful energy and fertilizer. The project is a result of co-operation between the municipality, farmers, industry and consumers. The digestate from Karpalund is recycled as a bio-fertilizer and replaces chemical fertilizers.



The digestion process

Digestion is defined as the biological decomposition of organic matter of biological origin under anaerobic conditions with an accompanying production primarily of methane (CH₄) and carbon dioxide (CO₂). In biogas the methane content is approximately 65 % to 70 % by volume. Before you can use it as fuel for vehicles you must eliminate most of the carbon dioxide through upgrading.

Plant for upgrading gas

Through absorption with water under pressure (approximately. 10 bar), the carbon dioxide will decrease and the methane will increase to a purity of approximately 97 % by volume. The two upgrading plants in Kristianstad have a combined capacity of approx. 50,000 MWh/year.

Biogas grid

Kristianstad doesn't have a connection to the natural gas grid. Instead there is a local biogas grid connecting production, upgrading and filling stations.

Biogas company

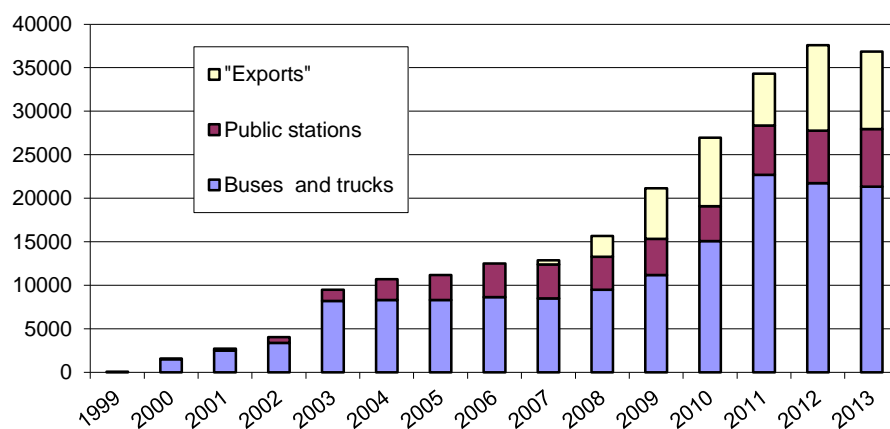
The biogas plant, as well as the units for upgrading gas, is owned by the municipal company, Kristianstad Biogas which is a part of the municipal energy company, C4 Energi

Utilization as vehicle fuel

One of the aims of the biogas project is to increase the use of biogas in the transport sector, since the gas can be replaced by other bio fuels in the district heating plant but bio fuels are rare in transportations. The Public Transport Company, Skånetrafiken, has introduced biogas in the city-transportation and regional buses. The municipality has established a car pool with biogas cars and some private companies and households use biogas vehicles. The waste management company uses biogas trucks for waste collection. The municipality is aiming to have a fossil fuel free fleet by 2020, mainly running on biogas.



Biogas as vehicle fuel, MWh/year



Facts 2013:

Biogas production

Biogas plant	49 000 MWh
Waste water treatment plant	7000 MWh
Disused landfill (for cogeneration)	13 000 MWh
Upgraded biogas	37 000 MWh

Substrate to Karpalund

Pre-treated, source separated food waste	25 000 tons
Slaughterhouse/food industry waste	35 000 tons
Manure (slurry)	32 000 tons
Other	5 000 tons
Liquid bio-fertilizer from Karpalund	93 000 tons

Biogas vehicles, number

Buses	70
Lorries/Trucks	20
Cars	400

(1 bus demands approx. 45 000 m³ upgraded biogas (4 500 MWh = 4500 litres diesel))

Recycling

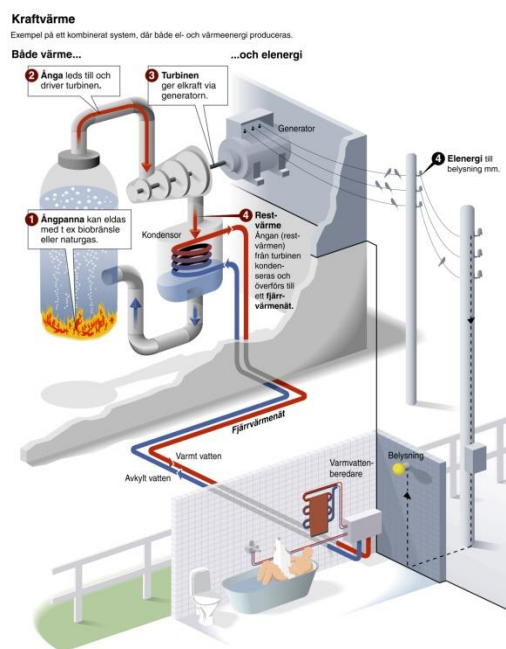
Reuse of material is a crucial part of waste management since both energy and resources are saved. In Kristianstad a large recycling facility was established in 2001, partly financed by state allowances.

In this recycling facility waste is sorted and then redistributed to the most suitable treatment. The recycling park has contributed to an extreme drop of landfill. Instead, packaging is being recycled, waste from parks and gardens is being composted and combustible waste transported to incineration etc.



Incineration

Material that is combustible but cannot be treated in the digestion plant or recycled goes to incineration. The process gives energy, but also some carbon dioxide emissions when plastics are burnt. Since the establishment of the recycling facility in Kristianstad the amount of waste going to incineration has increased while material going to landfill has decreased. Kristianstad municipality sends combustible waste to two other municipalities that have waste fuelled heat and power plants and the energy can be used for district heating in those municipalities.



Awards

Kristianstad has been awarded several times during the past years:

- 2001 Campaign for Take Off Award (EU)
- 2002 Climate Star (Climate Alliance)
- 2003 Energy Globe Award, 3rd prize
- 2004: Best work for environmental friendly cars (The Swedish association of Green Motorists)
- 2005: Best Climate Work in Swedish Municipalities (The Swedish Association for Nature Conservation)

Biogas film

Watch the biogasfilm available in English, French, German and Swedish.

<http://www.kristianstad.se/sv/Kristianstads-kommun/Sprak/English/Environment/Visits/Waste-Management/Movie/>

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