

State of the Nation Report

Landfilling Practices and Regulation in Denmark

Contents

1. Summary of Solid Waste Management Sector	2
2. Overview of Landfill Practices	5
3. Key Stakeholders in the solid waste disposal sector relating to Landfill.....	6
4. Legal and Policy Frameworks for Landfill	6
5. Domestic Country Strategy	8
6. References and Sources	9

DENMARK

1. Summary of Solid Waste Management Sector

The overall policy of the Danish government is to reduce the consumption of resources and to make use of the resources within the waste as many times as is technically and economically possible. The waste hierarchy reflects this angle of the waste problems:

1. Prevention
2. Preparation for re-use
3. Recycling
4. Recovery
5. Disposal

By landfilling valuable resources within waste is wasteful, that is why landfilling is now being considered the lowest environmental priority option for treating and disposing of waste.

Since 1992 all “new” landfills have to be owned by public authorities (municipalities) Public owned landfills cannot earn money (due to the “self-cost principle”). In 2012; 41 landfills met the EU landfill legislation; this number was 105 in 2007.

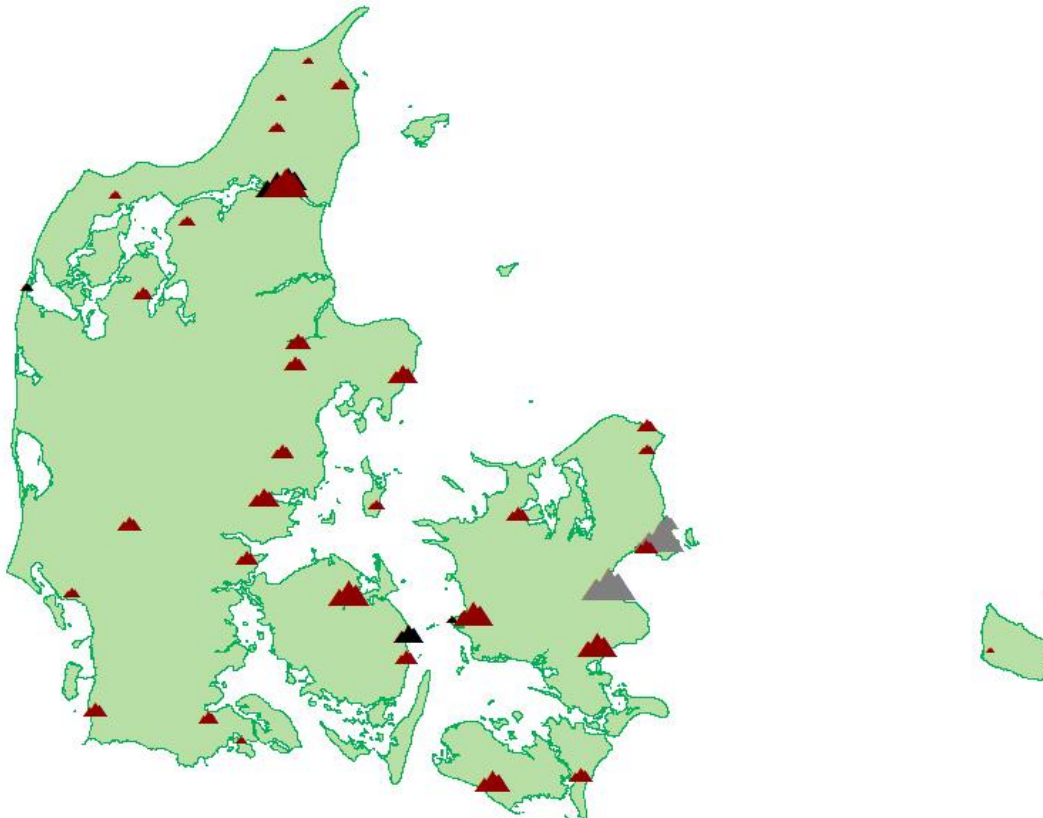


Figure 1: Location of landfills in Denmark /3/

A Danish ban on landfilling of combustible waste was introduced in 1997 as the first country in the world.

Implementation of the Landfill Directive and the Council decision

When the Landfill Directive (99/31/EC) (LC) and council decision (2003/33/EC) (CD) was implemented in the Danish legislation the Danish EPA decided to set more stringent rules. Some of the most interesting differences are:

Acceptance criteria depending on the location of the landfill (inland or close to the sea)

- Landfills close to the sea situated at location with big dilution \Rightarrow limit values from CD.
- Landfills close to the sea with low dilution and/or large landfill area \Rightarrow moderate stringent limit values.
- Landfills inland \Rightarrow stringent limit values (approximately a factor 5-10).

New landfills have to be located close to the sea

New Danish legislation will imply that all new landfills have to be located close to the sea. Existing inland landfills for non-hazardous mixed waste shall be closed down when established capacity are utilized - or latest by year 2020.

Location "close to the sea" depends on the distance from the sea (max. 15 km) as well as the fact that no public or private drinking water supply (from groundwater) takes place between the landfill and the downstream surface water.

Landfills close to the sea

Landfills close to the sea must fulfil a "site-factor". This "site-factor" is calculated by using the following formula:

$$SF = \frac{TA \times 30}{SA \times \text{dilution in the sea at the location}}$$

Where:

TA: Total area of the landfill (existing cells + cells closed down after 16. juli 2001)

SA: Standard Area = 10.000 m²

Dilution in the sea at the location: this value is found by using a "Dashboard" ("WEB-Application")

The "Site-factor", has to be $\leq 1,0$ and if a landfill cannot fulfil the "Site-factor" then the operator of the landfill can ask the local Water District Authority to evaluate - by use of a risk assessment - whether the landfill will cause any unacceptable harm on the environment.

If the Approval authorities cannot approve the landfill – the landfill has to be closed down.

Landfill Classifications

Danish landfills are now classified into four types: Inert, mixed (non hazardous), mineral waste (non hazardous) and hazardous waste.

Subcategories for landfills for non-hazardous waste:

- Landfills for mineral waste (TOC < 5%)
- Landfills for polluted soil
- Landfills for polluted dredging sludge
- Landfills for mixed waste (TOC \geq 5%)

Waste for Landfill and landfill capacity

In 2010 an amount of 1.811.000 tonnes of waste was landfilled in Denmark /3/. The distribution of waste is shown in the figure 2 below. Contaminated soil is the biggest fraction and is classified as non-hazardous waste in Denmark.

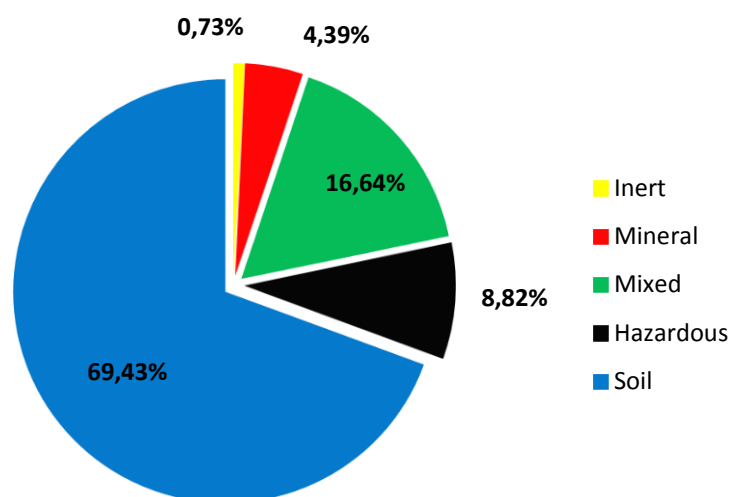


Figure 2: Distribution of landfilled waste 2010 /1/.

At the end of 2011 there was enough landfill capacity for years to come, but the capacity might cause trouble in some of the regions within the next couple of years, and more capacity is needed /1/

Landfill Capacity

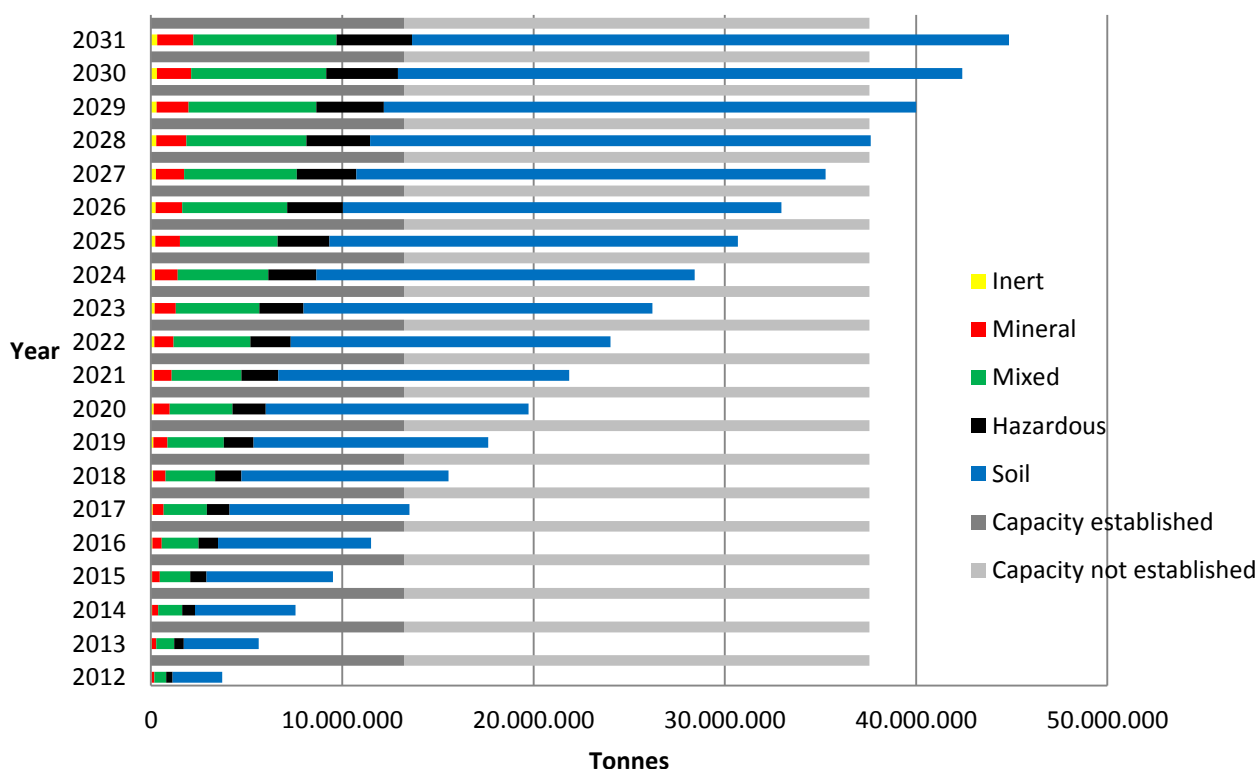


Figure 3: Landfill capacity Denmark /1/

2. Overview of Landfill Practices

As Denmark operates under the Landfill Directive the general policy for management of landfills is as described in the Directive.

Landfill management practices

All Danish landfill sites are constructed and operated to strict technical standards in order to reduce environmental effects.

When waste is received it is weighed and checked to ensure it is compliant with the landfill operating licence. The waste is compacted and covered to prevent odour and litter. Leachate is removed through a system of pipes and is sent to wastewater treatment.

If the landfilled waste is expected to form a certain amount of gas then this gas will be removed through a collection system of pipes. Where possible the gas will be utilised and any residual gas combusted in an enclosed flare. In Denmark there are at present 29 gas plants in operation. These gas plants are primarily operating at older landfills, since new landfills in Denmark have a low content of organic material. /2/

When landfills are closed they are covered completely with minimum 1 m of clean soil. To maintain the breakdown and leaching of substances in the waste, the soil used for covering must be permeable. The strategy “Every generation cleans up after itself” is the reason why breakdown and leaching of substances in the waste has to be maintained. Because of the permeable covering it will be necessary to collect leachate and if necessary gas in a period of at least 30 years after the landfill has been closed.

Current Status and Trends for Landfill Design

The general policy for designing a Danish landfill contains presence of a liner, a collection system for leachate and if necessary also a collection system for gas. The depths of waste depend on the location of the landfill.

Landfills are typically designed with a steepness of the slopes of 3 to 1.

Since biodegradable municipal waste is no longer being landfilled in Denmark not all landfills have collection of gas in their permits. If the landfill was started up before 1997 when landfilling of biodegradable municipal waste was not prohibited or if the landfilled waste for some reason is expected to form a certain amount of gas then the gas is collected through a system of pipes. The gas may be burnt off or used in an energy generation plant which contributes energy to the national grid.

3. Key Stakeholders in the solid waste disposal sector relating to Landfill

Some of the key Stakeholders connected to Landfills in Denmark include: Danish Environmental Protection Agency, RenoSam (waste-union of Danish municipalities), DAKOFA (waste-union of Danish authorities, municipalities, organisations and companies), Local Authorities, Private- and public Waste Management Companies and DepoNet (network for sustainable landfilling).

4. Legal and Policy Frameworks for Landfill

Current legal framework

In Denmark the operation of waste management, including landfills, is regulated by The Danish Environmental Protection Agency which is part of the Danish Ministry of the Environment.

The EU Landfill Directive (99/31/EC) was implemented in Danish legislation by issuing a Statutory Order on landfills in June 2001. The EU Council Decision establishing criteria and procedures for the acceptance of waste at landfills (2003/33/EC) was implemented in Danish legislation in March 2009 by an amendment to the Statutory Order on landfills.

As a general rule the municipalities in Denmark are the permit authority regarding environmental permits on landfills. All Danish landfills are as a main rule equipped with liners and leachate collection systems.

In the case of inspection authority, this task is handled by The Danish Environmental Protection Agency as regarding all public owned landfills whereas the municipalities – in general - are the inspection authority regarding private owned landfills.

As part of the implementation of the EU Landfill Directive a Statutory Order on education of all employees at landfills was issued in 2001. The Order requires that all employees at Danish landfills shall obtain a certificate in order to work at a landfill. All operators responsible for the daily tasks at a landfill shall hold an “A-Certificate” while the rest of the employees shall obtain a “B-certificate”. Before achieving a certificate the employees have to pass a test on 3 different topics.

Policies or mandates that may affect waste streams

The landfill directive sets targets for landfilling of biodegradable municipal waste. In 2006 less than 5% of the total amount of biodegradable municipal waste was landfilled in Denmark.

A large quantity of the total amount of waste produced in Denmark is recycled. Only 6 % of the total amount of waste produced in Denmark is disposed of at landfills. /4/

The Danish Government has – in the national waste management plan - set targets to ensure a large degree of recycling. Furthermore the effort of landfilling constantly smaller amounts of waste should be continued.

5. Domestic Country Strategy

The Danish waste policy consists of 7 elements:

1. We must prevent the making of waste, including minimizing the amount and the hazardousness of the waste
2. We must reduce the loss of resources
3. We must reduce greenhouse gas emissions from waste treatment
4. We must reduce the total impact of the environment from waste
5. We must secure that we get the most environment for our money
6. We must increase the quality of the waste treatment
7. We must secure an efficient waste sector

Focus on increased reuse and recycling is important and it has to be secured that the quality of waste treatment is increased. The technologies for waste treatment must be improved continuously so that valuable resources within the waste are utilized and hazardous substances in the waste are being sorted out. We must also make sure, that combustible waste is not disposed in landfills but is sent to incineration. /5/

List the elements the country is using and plans to use to overcome the barriers and promote methane emission reductions from landfills.

In Denmark there are a number of methods to encourage methane emission reductions. These include the following:

- Source separation of biodegradables
- Incentives for waste minimisation and recycling
- Biocover solutions

Biocover is a method for reducing greenhouse gas emission from landfills. Biocover started as a LIFE project. The idea of the project was to construct a biocover system incorporating the presence of the temporary cover by establishing permeable regions – so-called bio-windows – in the temporary cover using materials with higher permeability to enhance gas transport into the window area and high methane oxidation potential to oxidize the methane. Such materials could be mixtures of compost and coarse inert materials. /6/

The method has been used in two Danish landfills and the latest project showed a reduction of the methane emission from 8,3 kg/t to 1,2 kg/t analogous to a reduction of 86 %. /7/

6. References and Sources

- /1/ Deponeringskapaciteten i Danmark 2011 til 31, RenoSam Oktober 2011
- /2/ Arbejdsrapport fra Miljøstyrelsen 4, 2011, Udnyttelse af lossepladsgas Opsamling på gennemførte projekter under Miljøstyrelsens Virksomhedsordning
- /3/ BEATE - Benchmarking af affaldssektoren 2011 Deponering, Miljøstyrelsen 2012
- /4/ Orientering fra Miljøstyrelsen 5, 2010 Affaldsstatistik 2007 og 2008
- /5/ Regeringens Affaldsstrategi 2009-12, 1. Delstrategi
- /6/ www.biocover.er.dtu
- /7/ Reduktion af metanemissionen fra Klintholm losseplads ved etablering af Biocover , Miljøstyrelsen 2012