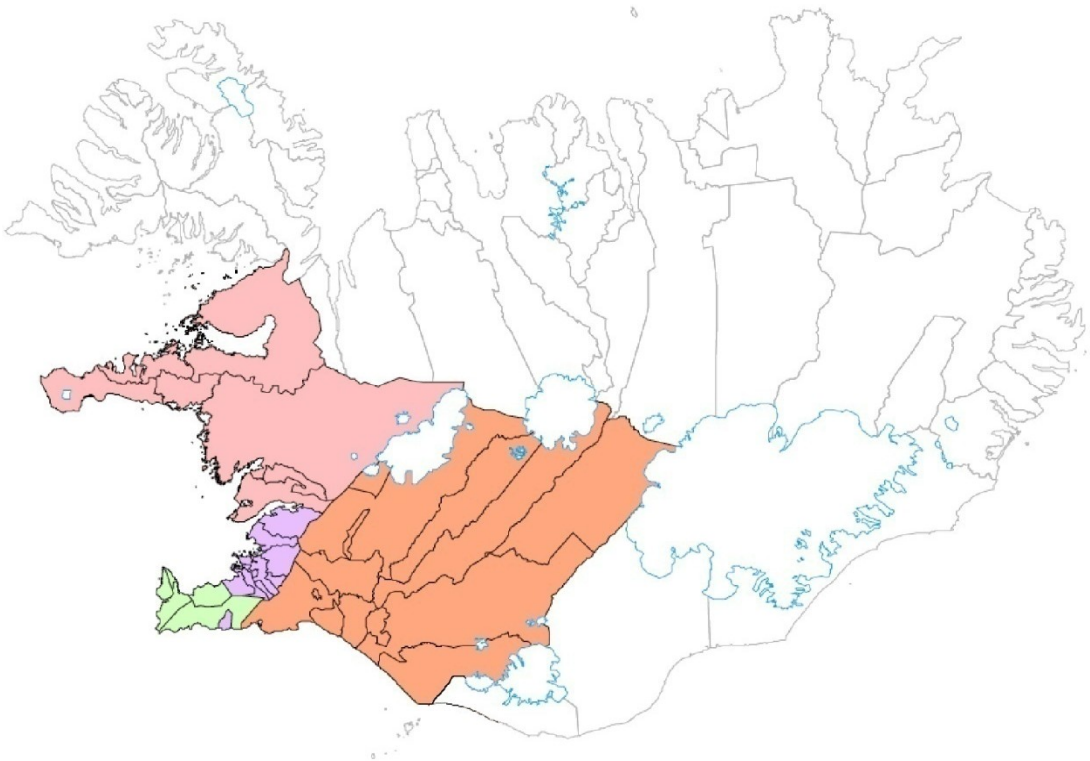
STRATEGIC PLANNING

FOR

THE MANAGEMENT OF WASTE

2009 - 2020



ENGLISH SUMMARY

MANNVIT
VERKFRÆÐISTOFA

1. Introduction

According to Icelandic law all municipalities are obligated to make a waste management plan. This has an origin in the directive 75/442/EEC of the Council of the European Communities.

In 2004 all municipalities in South and Western Iceland established common project management group to organize all activities needed to prepare a common waste management plan. This waste management plan covering waste from 230 thousand inhabitants in 43 municipalities was issued at the end of 2005. In this first issue of the plan the quantity of waste to be treated was determined, alternative ways of treatment discussed and it was evaluated how much organic waste needs to be treated instead of landfilled in 2009, 2013 and 2020 respectively, which are the target dates set by law.

In 2006 consultants were hired to investigate the costs and benefits regarding aerobic composting, anaerobic digestion, incineration and new landfill sites. After the various reports were finished in early 2007 a consultant was hired to make a cost optimization model for various scenarios of combination of different solutions for the whole area.

According to the legislation mentioned above a revised waste management plan shall be issued every three years. Therefore the municipal waste companies treating waste in this area renewed their cooperation in February 2008. In January 2009 the revised waste management plan for South and Western Iceland is being publicly reviewed.

2. Geographical information

The participating areas can be seen on the picture on the front page.

- Western Iceland (pink). Waste treatment in Western Iceland is operated by Sorpurðun Vesturlands hf. The area consists of 10 municipalities with total of 15 thousand inhabitants in 2006. The total quantity of waste in 2006 was estimated 29 thousand tonnes including 14 thousand tonnes organic waste. Sorpurðun Vesturlands currently operates a landfill site at Fíflholt, situated in Borgarbyggd, close to the geographic middle of this area. The distance from the Fíflholt site to the Álfsnes landfill site in Reykjavik is approximately 82 km.
- Suðurnes (green). Waste treatment in the area is operated by Kalka hf. (Sorpeyðingarstöð Suðurnesja). The area, which is close to the international airport in Keflavik, consist of 5 municipalities with total of 19 thousand inhabitants in 2006. The total quantity of waste in 2006 was 22 thousand tonnes including 14 thousand tonnes organic waste. Kalka operates an incineration plant in Helguvik, close to Keflavik Airport. An environmental impact assessment has been done for a landfill site for the bottom ash close by but the site has not received operating permit. The distance from the Helguvik waste incineration plant to Álfsnes in Reykjavik is approximately 67 km.
- The Capital Area (purple). Waste treatment in the capital area is operated by Sorpa bs. The area covers the capital and the neighbouring communities, total 8 municipalities with 192 thousand inhabitants in 2006. The total quantity of waste in 2006 was 272 thousand tonnes including 151 thousand tonnes of organic waste. Sorpa operates a landfill site at Álfsnes close to the city of Reykjavik.
- Southern Iceland (orange). Waste treatment in Southern Iceland is operated by Sorpstöð Suðurlands bs. The area consists of 11 municipalities with total of 18 thousand inhabitants in 2006. The quantity of waste in 2006 was 33 thousand tonnes including 22 thousand tonnes of organic waste. Sorpstöð Suðurlands operates a landfill site at Kirkjuferjuhjáleiga, but the operating permit ran out in 2008 and was only renewed for the maximum of 1 year while other alternatives are found. Sorpstöð Suðurlands also operates a meat and bone meal plant in Flóahreppur close to the main slaughterhouses in the area. The produced fat is used for many uses including firing the boilers of the plant. The meat and bone meal is partly used as animal feed for fur animals (foxes and minks) but partly landfilled. The distance from the Kirkjuferjuhjáleiga site to Álfsnes in Reykjavik is approximately 60 km.

In 2006 the municipalities in this area were down to 34 and the inhabitants were up to 243 thousand. It is estimated that the number of inhabitants will increase to 293 thousand in 2020. The total quantity of waste in 2006 was 346 thousand tonnes and is estimated to increase to 480 thousand tonnes in 2020 including 270 thousand tonnes of organic waste.

3. Type and Composition of the Waste

The main concern is the organic waste with potential greenhouse gas emissions and the land used for landfilling. Icelandic law no: 55/2003 requires that the landfilling of organic waste must be reduced considerably before 2020 with intermittent targets in 2009 and 2013. The waste companies are running out of landfilling space and have been unable to obtain permission to open new landfills. The boards of the waste companies have decided to stop landfilling of organic and combustible waste not later than 2020. The main types and quantity of organic and combustible waste in 2006 are according to the table below:

Household waste (MSW) and comparable waste from industry is collected from a single container only. Recycle stations are situated at strategic location for the inhabitants to get rid of various types of waste not to be dumped in the household containers.

Type of waste	Quantity, ktonnes	Organic, ktonnes	Recycled, ktonnes	Incineration, ktonnes	Landfilled, ktonnes
MSW	56	34	-	4	52
Mixed waste from industry	92	56	-	7	85
Garden waste	12	12	2	-	10
Vegetable and fruit waste	5	5	4	-	1
Animal manure	33	33	33	-	
Sludge	2	2	-	-	2
Slaughterhouse/fish waste	6	6	5	-	2
Newsprint and magazines	5	5	4		1
Pristine wood	17	17	17	-	-
Painted wood	7	7	7	-	-
Mixed wood	4	4	-	-	4
Paper and cardboard	12	12	12	-	-
Furniture	2	2	1	-	1
Textiles	1	1	1	-	-
Div. waste	8	3	5	1	2
Total	**263**	**200**	**91**	**13**	**159**

4. Strategic Action Plan

During 2006 and 2007 several treatment methods for organic and combustible waste were evaluated from environmental and cost point of view. All the methods were defined as "best available technology" according to IPPC. The different treatment methods, different plant sizes and various possible sites were used in a cost optimization model to calculate the most cost effective solution for the area as a whole. This has resulted in a common action plan for the four waste companies based on the following premises:

- All landfilling of organic and combustible waste will terminate no later than 2020
- The hierarchy of waste treatment has been decided (see below) based on the European waste hierarchy
- The available landfill sites for the next 12 years are clear
- Milestones for the next three years have been set

Sorpa's receiving station in Gufunes, Reykjavik

Kalka's incineration plant in Helguvik, Reykjanesbaer

The waste treatment hierarchy has been decided to be the following:

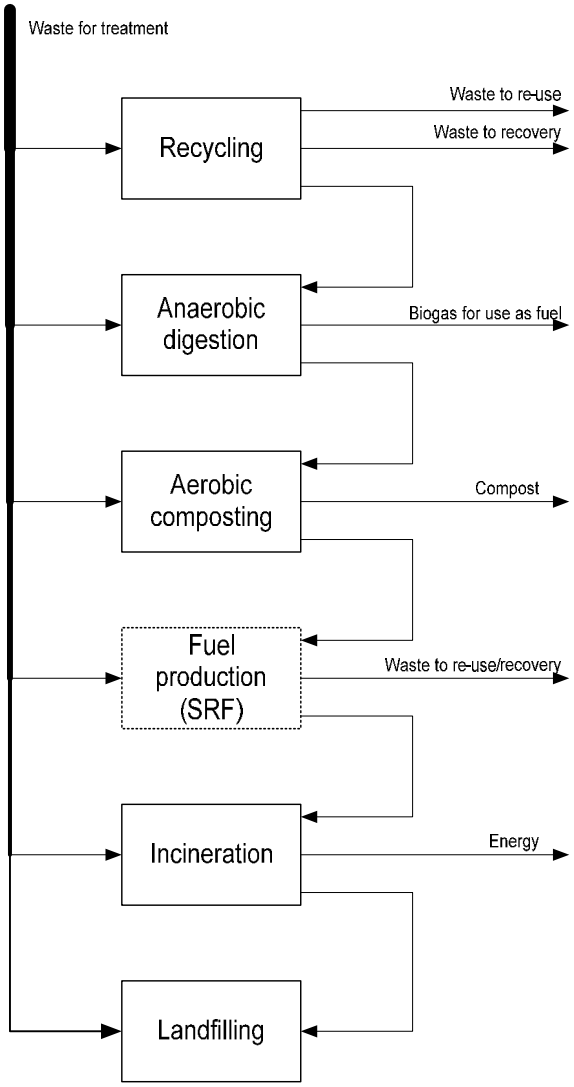
In a recycling stage reusable and recoverable waste is removed from the waste stream to avoid wasting valuable raw materials and to reduce the amount of waste for treatment.

From the recycling stage suitable waste is fed to an anaerobic digestion step to make as much biogas as practical from the organic fraction. The biogas is purified to >92% methane and used as vehicle fuel to replace imported fossil fuel.

The remaining waste from the AD step plus another incoming stream of suitable waste is composted in an aerobic composting step. Depending on selected technology for the composting re-usable and recoverable waste is removed from the waste stream before or after the composting step.

From the recovered waste like plastics, rubber, wood etc. solid recovered fuel (SRF) will be produced if economically viable. This fuel can be used for cement production to replace imported coal or exported to any interested buyer where price of energy is higher than in Iceland.

Some types of waste are combustible but not suitable for anaerobic digestion or aerobic composting. Furthermore, after 3 years there will be more than 2 million tonnes of accumulated waste in the Álfsnes landfill from the beginning of operation there. Therefore, a feasibility study will be done for a waste incineration plant in Álfsnes to incinerate the combustible waste stream to use the energy and to reduce the volume before landfilling. To further reduce allocation of new space for landfilling, the oldest part of the landfill site will be opened, when the landfill gas production falls off, to burn the remaining combustibles. The bottom ash might be usable for construction purposes, top cover layer or at least reduced in volume before landfilling again.



Snaefellsjoekull glacier, Western Iceland

Hekla volcano, Southern Iceland

Based on this hierarchy and the above premises the following plan for the next three years has been set forward:

1. **Recycling**
   a. Recycling will be enhanced and increased in the operation of all the waste companies.
   b. Receiving and recycling stations will be built at the operating sites of all the waste companies.
2. **Anaerobic digestion**
   a. During 2009 technologies for AD plants will be studied and possible suppliers selected.
   b. During 2009 the feasibility of AD plants of different capacities will be evaluated.
   c. Preparations for building a 10.000 tpy AD plant in Álfsnes will begin as soon as possible. Start of construction is estimated no later than 2010.
   d. The feasibility of similar AD plants at other locations will be compared to composting plants.
   e. It is assumed that the same sites will be used for AD or composting plants outside the capital area as for the recycling and transfer stations.
   f. Planning and permitting work will continue.
3. **Composting**
   a. During 2009 technologies for composting will be studied and possible suppliers selected.
   b. During 2009 the feasibility of composting plants of different capacities will evaluated.
   c. The economic feasibility of small composting plants will be compared to anaerobic digestion.
   d. The project management assumes that composting plants can be built in Álfsnes, in Fíflholt, in Helguvík and on the future operating site of Sorpstöð Suðurlands.
   e. Planning and permitting work will continue.
4. **SRF production**
   a. SRF is increasingly being used to replace or reduce coal usage.
   b. SRF is made of plastic film fragments, paper and cardboard, textiles, sponge, padding, small wood fragments and similar waste fractions.
   c. The economic and technical possibilities of SRF production in Iceland will be studied. This will be done co-currently with feasibility study on conventional waste incineration.
5. **Incineration**
   a. When AD and or composting plants are up and running and more information on the actual amount of combustible waste is available the feasibility of conventional waste incineration with waste heat recovery will be studied. Different sizes of incineration plants will be evaluated.
   b. The feasibility of exporting selected waste fractions or SRF for incineration in countries where energy prices are higher than in Iceland will be studied.
   c. The feasibility of different options will be compared.
   d. The goal is to publish this feasibility study within three years.
   e. Until new incineration capacity is installed or SRF production starts the Kalka incinerator will be used for waste fractions that needs to be incinerated. Instead waste fractions suitable for anaerobic digestion or composting will be processed by other waste companies as needed.
6. **Landfilling**
   a. After unsuccessful attempts to get permissions to open new landfill sites the conclusion is that the best option is to continue to operate the existing landfill sites.
   b. An application for extension of the lease agreement for the Álfsnes site has been sent to the city of Reykjavik.
   c. The waste companies will try to reach agreements with landowners, municipalities and environmental authorities for continued operation of the landfill sites in Fíflholt and Strönd.
   d. The city of Reykjavík has agreed to continue the process to change the master plan for the Álfsnes area, with the goal of optimizing the land use for landfilling. It is assumed that the change will be formally finished in middle of 2009 and permits for continued landfilling issued in fall 2009.
   e. The waste companies will try to obtain permission to landfill all type waste in any of the landfill sites in case of emergency situation if a worldwide epidemic of influenza will result in a total shutdown of all transport between areas in Iceland.
7. **Landfills for minerals and construction waste**
   a. The waste companies urge the operators of the current landfill sites for inorganic inactive minerals and construction waste to change their operations to recycling sites for construction materials.
   b. The purpose of the operation will be to produce useful construction materials, minerals for road construction etc.
8. **Minimizing waste formation**
   a. The waste companies will work with the municipalities to analyse the possibilities and constrains on tasks to reduce waste.

9. **Better information**
    a. The waste companies encourage the Icelandic EPA to start a project to improve collection of reliable information that can be used for waste treatment planning for the whole country as well as for individual municipalities.
10. **Coordination of procedures**
    a. The waste companies will check where procedures need to be coordinated and make suggestions to the municipalities on waste regulation, health regulations, waste collection and recycling procedures, waste collection fees, information and propaganda for the public etc.

Aerial view of Reykjavik area, seen from Álfsnes