Summary of the report:

Life Cycle Assessment
of Different Scenarios for
Waste Treatment of a Plastic
Bottle Used for Food Packaging.

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REPORT OVERVIEW

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This project has been carried out for Stabburet AS and Plastretur AS. Three different waste treatment methods for a plastic bottle have been analysed, as an example of waste treatment of plastic packaging from households.

The following conclusions are reached based on the Life Cycle Assessment (LCA) of the different treatment systems:
◦ The material recycling system is the most environmentally beneficial when compared to energy recovery and landfill. The main reason for this is the benefit gained from avoided virgin material.
◦ Energy recovery also gives a net environmental benefit for several of the impact categories, but when compared to recycling, the benefit is considerably lower.
◦ Landfill gives the highest environmental burdens when compared to recycling and energy recovery.
◦ Transport contributes very little to the total environmental loads.
◦ This study has not taken into account that when plastic packaging waste is recycled, it is made available for use in several future life cycles and can therefore replace virgin material more than just once. A recycled material is not at the ‘end-of-life’ phase of the life cycle; it is entering a new life cycle as a raw material. In order to assess the complete picture of the burdens and benefits arising from recycling, the system boundaries must be expanded to allow for recycling many times.
◦ It is important to be aware of the assumptions that these analyses are built on. The results must be used carefully as a basis for making decisions about whether one should recycle a waste material or not. However, the analyses show that there is a potential for great environmental benefit in systems with high recycling rates.</td></tr>
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Contents

Summary of the report:

Life Cycle Assessment of Different Scenarios for Waste Treatment of a Plastic Bottle Used for Food Packaging.

1 Background

This project has been carried out for Stabburet AS and Plastretur AS. Three different waste treatment methods for a plastic bottle have been analysed. The plastic bottle was chosen as an example of plastic packaging from households.

The principle aim of the project has been to compare the environmental effects that arise from the three different treatment methods: landfill, energy recovery and recycling.

2 Methodology

The study has been based upon the life cycle assessment (LCA) methodology, as described in the ISO-standards 14040-43. The LCA methodology has been used for the assessment of environmental impacts of different waste management solutions.

The functional unit (the basis for the analysis) has been the collection and treatment of one tonne of plastic bottles used for packaging of a food product including the food product remains.

Description of the three systems:

Landfill system:	The plastic bottles that are generated in households are collected together with residual waste and deposited on a landfill. It is assumed that there is no washing of the plastic bottles in households before their disposal.
Recycling system:	The plastic bottles that are generated in households are rinsed to remove the remaining food product, and collected with the source-sorted plastic packaging for sorting and recycling. It is assumed that the recycled material replaces an equivalent amount of virgin plastic.
Energy recovery system:	The plastic bottles that are generated in the households are collected with the source sorted plastic packaging to energy recovery. It is assumed that the plastic used for energy recovery replaces an equivalent amount of energy from alternative energy carriers (fuel oil). It is assumed that there is no washing of the plastic bottles in households before their disposal.

Figure 1 shows simple flow charts for the three treatment systems for the plastic packaging bottle.

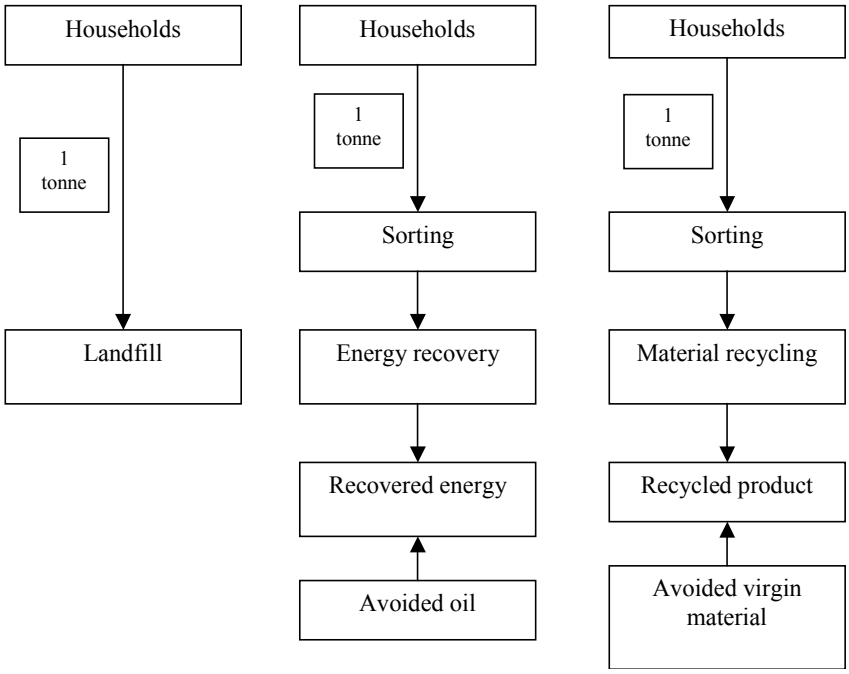

Figure 1: Flow charts for the three treatment systems for the plastic packaging bottle.

3 Environmental Life Cycle Assessment (LCA)

The environmental impact categories are presented for the following life cycle steps:

Activity	**Description**
Transport	Total transport activity for the whole life cycle.
Sorting	Environmental burdens from sorting the plastic bottles (recycling).
Waste treatment	Environmental burdens from the different waste treatment methods (landfill, recycling, energy recovery).
Avoided virgin material / energy	Avoided environmental burdens from the production and use of alternative virgin material and replaced energy.
Remaining food product	Environmental burdens from the treatment of the remaining food product.
Total	Total net environmental burden / benefit from the different treatment methods.

Figures 2 and 3 show the environmental profile for two impact categories for the life cycle of the plastic bottle for the three different treatment methods. Global Warming Potential and Acidification are presented in kg CO_2-equivalents and g SO_2-equivalents per tonne plastic bottles collected from households, respectively.

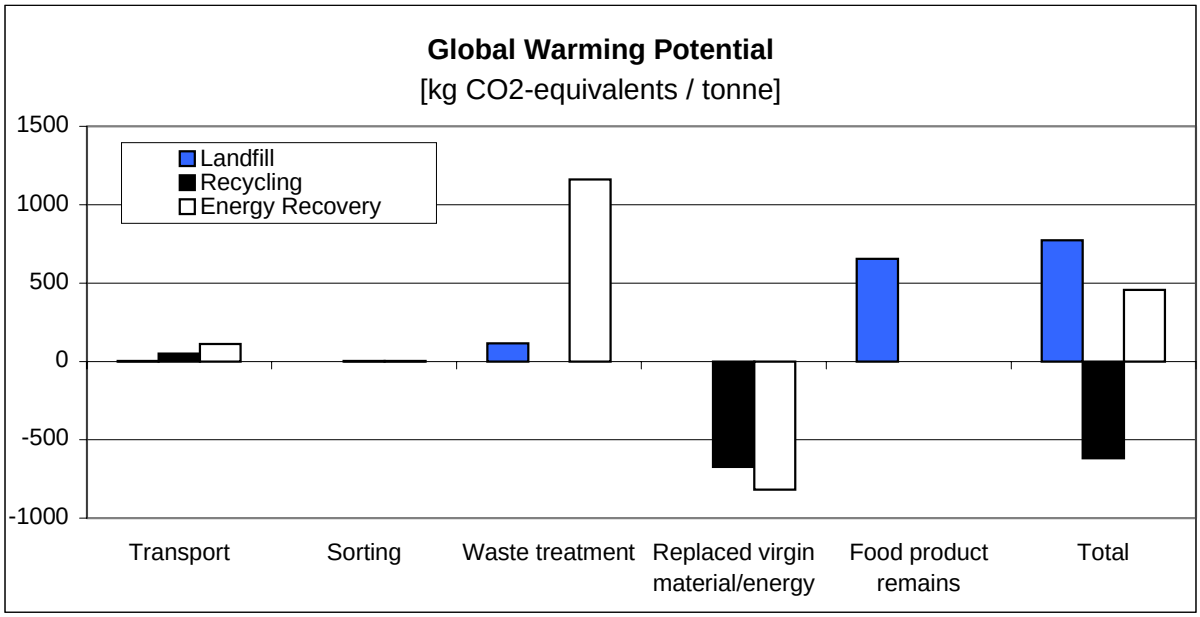

Figure 2: Global Warming Potential

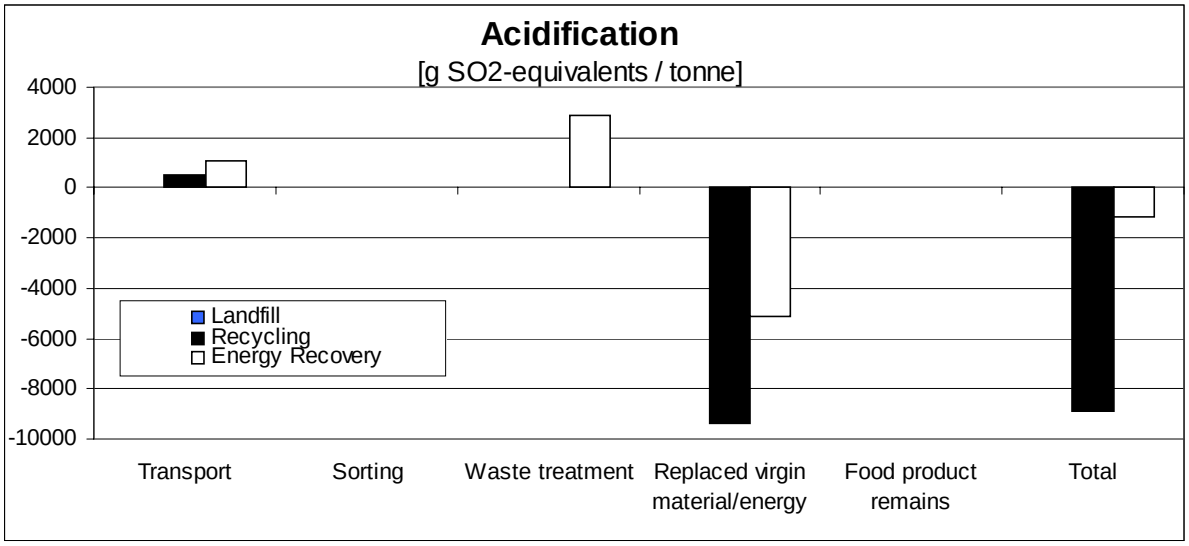

Figure 3: Acidification

The recycling system gives the most beneficial results for both the impact categories. The main reason for this is the benefit gained from avoided virgin material that occurs when the collected plastic is sent to recycling. These benefits are greater than the benefits from replaced energy.

The landfill system gives the highest environmental burdens, mainly because of the emissions arising from the breaking down of the organic material in the food product remains.

Transport contributes very little to the environmental burdens for the systems when compared to the contributions from the waste treatment method, or the substitution of energy carriers and virgin material.

4 Conclusions

The following conclusions are reached based on the Life Cycle Assessment (LCA) of the different treatment systems:

- The material recycling system is the most environmentally beneficial when compared to energy recovery and landfill. The main reason for this is the benefit gained from avoided virgin material.

- Energy recovery also gives a net environmental benefit for several of the impact categories, but when compared to recycling, the benefit is considerably smaller.

- Landfill gives the highest environmental burdens when compared to recycling and energy recovery.

- Transport contributes very little to the total environmental loads.

- This study has not taken into account that when plastic packaging waste is recycled, it is made available for use in several future life cycles and can therefore replace virgin material more than just once. A recycled material is not at the 'end-of-life' phase of the life cycle; it is entering a new life cycle as a raw material. In order to assess the complete picture of the burdens and benefits arising from recycling, the system boundaries must be expanded to allow for recycling many times.

- It is important to be aware of the assumptions that these analyses are built on. The results must be used carefully as a basis for making decisions about whether one should recycle a waste material or not. However, the analyses show that there is a potential for great environmental benefit in systems with high recycling rates.

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