Nordic Council
of Ministers

BARRIERS FOR UTILISATION OF BIOWASTE

**Analysis of Institutional barriers for
using Biowaste as a resource**

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Preface

A precondition for a more circular economy is a more efficient use of resources and the utilisation of waste as a resource. However, the existing regulation of waste does not always promote this as its primary aim is to ensure safe waste handling. In order to improve a better utilisation of waste as a resource a first step is to get a better understanding of the barriers that hinders the utilisation of waste as a resource.

The aim of this report is twofold. Firstly, to describe the formal barriers that hinders the recycling, reuse or other utilisation of biowaste. The focus is both on barriers related to regulation (from EU to national level), demands from authorities, taxes, business standards and certification schemes. Secondly, to point at solutions that can minimise these barriers at different policy levels. Some barriers can be addressed on a national or local level whereas others must be addressed through EU.

We hope the report can inspire policy makers in the Nordic countries and elsewhere to work for the removal of barriers that hinder the utilisation of biowaste as a resource.

The report has been written by a group of Nordic consultants: NIRAS (DK, NO and SE), VTT Technical Research Centre of Finland (FI) and Copenhagen Resource Institute (DK).

February 2017

Signe Krarup

Chairman of the Working Group on Environment and
Economy under the Nordic Council of Ministers

Summary

Introduction

The political and business communities in the Nordic region are beginning to embrace the concept of the circular economy as the key to securing an environmentally and economically sustainable future. Feeding end-of-life products and materials back into the value chain avoids the environmental and economic costs associated with unnecessary extraction of raw materials on the one hand, and reduces the environmental and economic costs associated with disposing of waste on the other.

Increasing prices of raw materials, stronger consumer demands for greener products, and new technical capabilities also drive the race for increasing resource efficiency along the value chain. However, experience indicates that these factors alone are often insufficient to push businesses to overcome the formal and informal barriers that restrict the use of waste as a resource.

Waste regulation helps define the framework for the utilisation of waste as a resource, but its primary aim is to ensure safe waste handling. To smooth the path for increased utilisation of waste as a resource, a thorough understanding of the formal barriers that hinder the recycling, reuse or other utilisation of waste is needed.

This report examines the formal barriers – such as regulation (from EU to national level), demands from authorities, taxes, business standards, certification schemes – that impede the utilisation of biowaste as a resource. Impediments include administrative burdens, financial penalties, and outright bans.

The report is built on an extensive desktop study of barriers in the Nordic countries, combined with structured interviews with key actors along the value chain of biowaste in the Nordic region, and responsible authorities.

Barriers

The desk study identified 13 barriers, while 66 barriers were identified during the interview process. Most of the barriers identified in the desk study were also identified in the interviews, but the interviews provided a broader and more detailed picture of these barriers.

The cause of the barriers experienced varies greatly. Some barriers seem to be caused by a lack of knowledge and/or competence within authorities and/or companies, while others by the specific interpretation, enforcement, case processing or administrative practise of the supervising authority. Some stem from explicit prohibitions, requirements and/or lack of clarity in the legislative texts themselves.

The practice of utilising biowaste exists at the intersection of different policy domains, each with their own aims, methods, processes and bureaucracies. Utilising biowaste as a resource is not the primary function of these legislative domains and as such the applicable legislation is not designed to aid the utilisation of biowaste. To utilise biowaste, actors have to comply with these regulations, and this presents two immediate barriers to utilisation:

- Actors need to be aware of, comply with and administer for several overlapping policy domains representing a cognitive, technical and administrative burden.
- These policy domains are insufficiently flexible to facilitate the better use of biowaste, and apply blanket regulation to serve their own specific goal – protection of the environment or food safety for example.

A third point, addressed below as specifically relevant for the planning and construction of biowaste treatment facilities, is that there is no single, reliably applied set of environmental and permitting criteria for the given legislation.

The majority of the identified barriers are variations of a number of recurring barrier themes or general issues, although some barriers are more singular in nature – ranging from the specific to the curious.

Table 1 shows an overview of the barriers. These barriers are described in detail in chapter 4.

Table 1: Overview of barriers

	Layered/unclear legislation	Administrative burdens	Varied enforcement
Feed	Difficulties with Animal By-Products (ABP)	Traceability of feed	
Fertilizer	Sludge regulation ABP Fertilizer regulation	For "unapproved substances"	For unapproved substances
Treatment facilities	Environmental permission	Due to lack of clarity and varied enforcement	Environmental permission
Public private issues	Lack of clarity on definition as waste		
Food	Food safety		

Solutions

The solutions to these barriers can be explored and implemented at different policy levels. Some barriers can be addressed on a national or local level whereas others must be addressed through EU, as illustrated below.

Figure 1: Different levels for implementation of solutions

Few barriers can be directly addressed by single national agencies acting alone – and even in those cases, cooperation with other agencies is expected to provide better result.

Many of the barriers can be overcome without changes in legislation: by reducing administrative burdens, improving policy implementation on the ground, and increasing information and guidance for companies and local authorities. One way to organize this effort could be to set up a task force with representatives from relevant agencies, industry organizations and the organization of municipalities. Such a task force could function as the focal point for identifying the most relevant topics for further work and for disseminating information and clarification on policy implementation.

In the longer term, the task force could also gather knowledge about insufficiently integrated or contradictory EU regulation, and use this knowledge to influence future EU policy making. Another issue on EU level is legislation that is not suited for the transition towards a circular economy. The task force could also provide valuable knowledge with the goal of influencing the EU regulation in this field.

Cooperation between task forces in the Nordic countries could provide valuable experience sharing and contribute to a common Nordic approach to influencing EU regulation.

Conclusions

The barriers to better utilisation of biowaste are diffuse, and the solutions complex. A mixture of changes in regulation, improvements in implementation of the relevant regulation, better cooperation and coordination between regulative bodies, and better

guidance and information sharing between national authorities, municipal authorities and the business community would together create a more reliable and robust framework for utilisation of biowaste.

In particular, potential improvements that would not necessarily require regulative changes and could be implemented within a short timeframe include:

- Ensuring Uniform terminology is used across relevant regulations.
- Clarifying issues covered by several regulations.
- Increasing guidance and information for local authorities and companies.
- Aligning documentation and reporting demands.

Some solutions are connected to specific regulations. These include:

- Possibility for alternative documentation systems for Animal By-Products.
- More flexible acceptance procedures for using materials as fertilizer.
- Providing criteria for visible impurities (in Denmark).

The development and use of new tender concepts could increase incentives for investments in treatment facilities and technological development. New tender concepts may also be able to solve some of the public-private dilemmas encountered by municipalities and companies.

In the longer term, barriers stemming from EU regulation can be addressed by attempting to influence the EU policy process, particularly in policy areas where regulation is overlapping, contradictory or hindering utilization of biowaste. Cooperation between the Nordic countries may make such an effort more likely to succeed.

Another long term solution is to provide regulation that is more supportive of market and technology transitions. The current regulation often requires certain processes and allows certain fractions for certain utilizations. Regulation that incorporates procedures for more quickly assessing and authorising new solutions could help drive the development of such new solutions. Areas where this approach could be useful are:

- Safety of products.
- End of waste criteria.
- Private public dilemmas.

These policy areas are, to a large extent, dependent on EU regulations, which means that significant changes in these areas need to be addressed at the EU level. Policy approaches that ease transition are broadly in line with the EU's Circular Economy agenda, which indicates that there could be broad support for such changes from EU institutions and Member States.

1. Introduction

The political and business communities in the Nordic region and the wider world are slowly embracing the concept of the circular economy as the key to securing an environmentally and economically sustainable future. Feeding end-of-life products and materials back into the value chain avoids the environmental and economic costs associated with unnecessary extraction of raw materials on the one hand, and reduces the environmental and economic costs associated with disposing of waste on the other.

Increasing prices of raw materials, stronger consumer demand for greener products, and new technical capabilities also drive the race for increasing resource efficiency along the value chain. However, experience indicates that these factors alone are often insufficient to push businesses to overcome the formal and informal barriers that restrict the use of waste as a resource.

Waste regulation has a central role to play in creating the framework for the utilisation of waste as a resource. One of the main aims, however, is to protect nature and human wellbeing against harmful and/or dangerous substances. As a consequence, materials classified as waste immediately fall under a strict and comprehensive regulatory regime defining how they must be handled, transported and disposed of. This makes it difficult or often un-profitable for companies to capture and recycle waste materials.

To smooth the path for increased utilisation of waste as a resource, a thorough understanding of the formal barriers that hinder the recycling, reuse or other utilisation of waste is needed.

Formal barriers are in this study understood as conditions and demands from formalized institutions such as regulation (from EU to national level), demands from authorities, taxes, business standards, and certification schemes, which impedes the utilisation of waste as a resource. The reasons can be, that it imposes administrative burdens, makes possible solutions for utilisation of the biowaste more expensive, or impossible.

This project investigates these barriers as they relate to the utilisation of biowaste in the Nordic countries.¹

Statistics on the production of biowaste across the Nordic economies are not particularly comprehensive nor reliable – discrepancies in the way in which the statistic are recorded and reported means that they are not entirely comparable. However, a recent European Commission project, FUSIONS,² estimated the amount of food waste produced along the value chain in the EU-28 countries. About 87.6 million tonnes of food

¹ Defined as biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants.

² <http://www.eu-fusions.org/phocadownload/Publications/Estimates%20of%20European%20food%20waste%20levels.pdf>

waste are estimated to be generated in the EU-28 along the whole value chain (with a 95% confidence interval of +/-14 million tonnes), divided as illustrated in Figure 2:

Figure 2: Food waste in each step of value chain, EU-28, million tonnes

The FUSIONS project estimated the costs associated with this food waste to be around EUR 143 billion, about EUR 98 billion of which is from food waste in households. This is a larger share of total costs than the household share of amounts partly because costs accumulate along the value chain (the wasted product costs more for the household than for processing), and partly because more of the waste is edible.

At the Nordic level, the project only contained actual data for Sweden and Denmark, but this painted a somewhat similar picture, as illustrated in the figures below. Please note that these do not include the “processing” phase, as the FUSIONS project did not find any reliable data for this phase for the Nordic countries.

Figure 3: Share of foodwaste occurring in different parts of the value chain Denmark (left) and Sweden (right)

There is a wide variation between and within Nordic countries in how the waste is processed. The current treatments constitute a spectrum of more or less valuable usages, ranging from incineration, composting, biogasification (including use of residual material as fertilizer), to feed for livestock and redistribution for human consumption. This project seeks to identify and propose solutions to the barriers that prevent biowaste being utilised to its maximum potential.

According to the EU's Communication on future steps in biowaste management in the European Union (COM(2010)235 final), the following benefits could be reached if recycling and recovery of biowaste are maximized:

- Significant financial savings (see above).
- Up to 44 million tonnes of CO₂ avoided at the EU level.
- Resource savings by substituting approx.: 10% phosphate fertilizers, 9% of potassium fertilisers and 8% of lime fertilisers.

There are clear socio economic and environmental benefits from improving utilisation. This project hopes to take a step towards increased utilisation by identifying existing barriers and identifying solutions.

This project focuses on the barriers that present themselves to (potential) actors seeking to make better utilisation of biowaste in Nordic countries. The technical and practical barriers that limit the current opportunities are well documented: this project focuses on the institutional barriers to better utilisation, as these are also anticipated to be one of the factors that limit technical innovation and deployment of infrastructure that could overcome the practical problems.

Information on institutional barriers found in existing literature provides a useful starting point, but does not itself contribute with significant knowledge. To build on this base, structured interviews were held with stakeholders within the biowaste value chain to identify barriers and gather opinions about possible solutions. This provides a wealth of new information directly from the people facing the barriers. This serves to provide a reasonably comprehensive coverage of the barriers and an idea about potential solutions, but also draws out the critical question of perception of barriers – how perceived barriers influence action – rather than relying on literature or analysis of legislation, which could only identify where barriers actually exist.

These interviews were followed by a further round of interviews with authorities – again, to explore barriers and solutions – but this time using the knowledge gained from the first round of interviews to guide the questioning.

This report describes the identified barriers and solutions in detail as they were uncovered, then presents a synthesis of these findings, together with recommendations for solutions that could help alleviate or remove some of the most pressing barriers.

2. About the method

The analysis is based on a combination of existing and new data. Existing data on the topic has been identified in a desk study of relevant literature, and new qualitative data has been gathered by conducting semi-structured interviews with 24 actors from different parts of the value chain in Denmark, Norway, Finland and Sweden. Furthermore, in order to clarify details about the identified barriers and qualify potential solutions to reduce or remove the barriers, we conducted interviews – or “solutions dialogues” – with six different authorities across the involved countries.

2.1 Desk study

The desk study provides overview of the existing body of knowledge and data about the formal, institutional barriers for using biowaste as a resource that are already known and can be found in the literature.

Relevant publications were identified through literature search in each country. The literature search resulted in a list of relevant material from the various national Environmental Protection Agencies, in academic articles as well as other publications focusing on biowaste, resource efficiency and institutional barriers. Additionally, the desk research established an overview of the most relevant national and European legislation (see Appendix 1 for a list of relevant literature).

One of the main conclusions from the desk study is that existing literature is rather sparse on the institutional barriers for the utilisation of biowaste. While subjects close to the focus area of this project are covered in detail (such as the prevention of food waste), barriers to the actual utilisation of biowaste once it occurs has not been the subject of extensive study in the Nordic region.

The desk study formed a base on which to build and qualify the interview phase, e.g. in relation to identifying which commercial actors it would be most relevant to recruit and in order to develop interview guides that are customized to uncover additional barriers as best as possible.

2.2 Interviews

The interview phase identified unknown barriers and described known barriers in further details. Furthermore, the interviews served to bring solutions and ideas from the actors in the value chain into the analysis.

Barriers to the utilization of biowaste as a resource exist at several points in the value chain: when producing, processing, buying, selling transporting, preparing and

cooking food and when collecting and using the biowaste. In order to identify as many relevant barriers as possible, the interview study included interviews with actors involved in all of the various processes in the value chain (except agriculture), as visualized in Figure 4: Interviewed actors in the value chain: below. Relevant industry organizations and authorities were also interviewed.

Figure 4: Interviewed actors in the value chain: 1) Food processors, 2) Wholesale and retail, 3) Commercial kitchens and private consumers, 4) Waste operators, and 5) Recovery and recyclers

2.2.1 Preparing the interviews

Qualitative, semi-structured interviews has the methodological advantage over surveys that open ended questions makes it possible to understand more about how the interviewees see the world, their motivations, values and modes of actions than closed questions. This makes semi-structured interviews the best way to uncover experiences of hitherto unknown barriers.

However, while a qualitative approach serves to uncover experienced barriers it is not suited for detecting potential or hypothetical barriers nor is it suited to uncover barriers that are so ingrained that nobody wishes to question them.

For this study, in order to ensure the companies' willingness to take part in the study, and to ensure the validity of data, the interviewees are anonymised.

Based on the knowledge from the desk study a generic interview guide was designed and adjusted to fit the specific business models, work routines, practices and experiences of the various types of actors that were interviewed. See Appendix 2 for an example of the interview guide.

2.2.2 *Selecting and recruiting interview candidates*

On basis of the above conceptualization of the value chain and the results from the desk study, a prioritized list of relevant actors to interview in each country were produced. The interview candidates were chosen and prioritized with consideration for creating a reasonable balance between the different types, sizes and positions of actors in the value chain.

However, as can be seen in Table 2 below, the conducted interviews show an overrepresentation of companies at the end of the value chain (e.g. waste operators and treatment facilities) and fewer companies at the beginning or middle of the value chain. The reason for this is twofold. The overrepresentation reflects the fact that companies at the end of the value chain were most interested in participating because they were most affected by the barriers. The primary reason for this is that biowaste and the various ways of utilizing it constitute the core business of – and the very reason d'être for – companies at the end of the value chain. Generally speaking, companies for whom biowaste is a central part of their business (such as waste operators, treatment facilities, fertilizer traders, etc.) showed great interest in participating in the study. And likewise, supermarkets, commercial kitchens and food processors showed less interest to participate and were both less affected by and experienced fewer barriers.

Names and contact information of potential interview candidates were identified in the desk research, as well as by using the project team's network and company contacts in the four countries to identify relevant companies and persons.

Recruiting the right person to interview in the company is key in order to obtain reliable, relevant and valid data. To ensure that we recruited the right employees in each country, a recruitment guide, was developed. However, the recruitment process proved surprisingly difficult. This was partly due to the summer holidays, partly due to the fact that some of the actors did not experience barriers and therefore had little incentive to participate, and partly due to the fact that often, even in big companies, only one or two employees know the specific details of whether the company has encountered any "formal institutional barriers for using biowaste as a resource" or not.

2.2.3 *Conducting interviews in four countries*

In total, 24 interviews in four countries were conducted. Most were conducted by phone and a few by email when more convenient for the interviewees. Interviews in Norway were conducted by a Norwegian researcher, interviews in Sweden by a Swedish researcher, etc. To achieve consistency in the collected material, detailed guides for

recruiting, interviewing and summarizing the data were designed and distributed to the researchers in the respective countries. The table below shows the division of interviews per country and type of actor.

Table 2: Number of conducted interviews per country and company type

Company type	DK	NO	FI	SE	Total
Food processor	1		2	3	6
Retail (supermarket)		1	1	1	3
Commercial kitchen	1				1
Redistributor	1				1
Waste operator and treatment facility	2	3	2	1	8
Fertilize trader	1				1
Industry association	2	1	1		4
Total	8	5	6	5	24

2.2.4 Solutions dialogue with authorities

After interviewing actors along the value chain, we arranged a short interview – or solutions dialogue – with the relevant national authorities, often the environmental protection agencies or the food safety administration. The purpose of the dialogue was to qualify the identified barriers, shed light on further details in the legislation or administrative practices, to hear the authorities' opinion on a selection of the most pronounced barriers and potential solutions, and to hear about coming changes in the legislation.

There were large differences in how interested and comfortable the authorities were to share their point of view in interviews. Some national agencies shared a lot, while others shared only a little information. One reason for agencies being cautious in sharing knowledge could be that the issue of institutional barriers and resource efficiency are on the political agenda, as is the relationship between authorities and companies.

2.2.5 Analysis and presentation of data

The interview data covers a range of topics, industries, legislations and processes. In that sense, the complexity of the data material mirrors the complexity of the legislative practice and framework that regulates actions and business of many of the interviewed companies.

Many of the barriers occur at the intersection between different legislation and authorities and are thus interconnected in complex ways. Due to this complexity it has not been possible to develop one, all-encompassing structure that can be used to describe and present all of the identified barriers (e.g. a value chain perspective). Some barriers are thus described according to the specific legislation that cause them, while others are described according to the administrative practices and procedure, production processes, products, uses or overall issues they are related to.

When analysing and presenting the barriers we describe them according to the companies' experience (sometimes using direct quotes), the regulation, authorities, consequences and potential solutions related to the barrier.

Each conducted interview has been assigned a code, indicating the country and number of interview. Table 3 below shows the codes and kind of company interviewed in each interview.

Table 3: List of conducted interviews

Interview code	Company type and country
DK 1	Fertilize trader, Denmark
DK 2	Biopulp producer, Denmark
DK 3	Redistributor, Denmark
DK 4	Industry Association, Denmark
DK 5	Biogas plant, Denmark
DK 6	Industry Association, Denmark
DK 7	Food processor, Denmark
DK 8	Commercial kitchen, Denmark
FI 1	Retailer, Finland
FI 2	Food processor, Finland
FI 3	Biogas plant, Finland
FI 4	Industry Association, Finland
FI 5	Waste operator, Finland
FI 6	Food operator, Finland
NO 1	Retailer, Norway
NO 2	Industry Association, Norway
NO 3	Waste operator, Norway
NO 4	Biogas plant, Norway
NO 5	Biogas plant, Norway
SE 1	Food processor, Sweden
SE 2	Food processor, Sweden
SE 3	Industry Association, Sweden
SE 4	Distributor of biogas, Sweden
SE 5	Retailer, Sweden

The barriers identified in each interview have been coded by adding an extra digit to the interview code. The first barrier identified in the first Danish interview (with a Fertilize trader) thus has the code "DK 1.1", the second identified barrier from the third Finnish interview (with a Biogas plant) has the code "FI 3.2", and so forth.

3. Identified barriers

13 barriers were found in the desk study and 66 barriers were found through interviews. Most of the barriers found in the desk study were also found in the interviews, but the interviews provided a broader and more detailed picture of the barriers.

In order to frame the results of the study correctly, it should be noted that due to the subject of the study being barriers, the study has a pronounced barrier bias. The researchers, interviewers and interviewees involved have focussed explicitly on barriers, burdens and other problematic and negative experiences with regulations and authorities. And while there are many barriers to address, as will be seen in the following sections, it is fair to state that a portion of the interviewed companies – among others a major food processor – have stated that they do not experience any barriers of importance, or that the barriers they have fought with in the past have been minimized due to changes in legislation and/or enforcement practices.

It is also important to note that the interviews were not comprehensive and the interview results not necessarily representative of all barriers encountered by actors within the respective points of the biowaste value chain across the four countries studied.

3.1 Categorization of identified barriers

All identified barriers have been compiled and organized according to which theme (or general issue), authority, legislation, country and company type they relate to. For an overview of the barriers see Appendix 4: Overview of identified barriers.

However, it is not always possible, on basis of the interview data, to determine the exact nature of the barriers experienced by the interviewees. Often the barriers relate to disagreements about which interpretations of the legislation are correct or how it ought to be enforced. Often the interviewees do not know or remember exactly which regulation or authority the barriers are connected to. And often they experience the barriers as all mixed up, partly because the details of the process can be hard to recall, partly because many of the legislative issues are mixed up and interconnected in complicated ways.

Furthermore, companies and authorities naturally quite often have conflicting interests in the legislative matters. Clarifying which understanding of the legal specificities is correct, that of the companies or that of the specific local authority, acquires more research than the framework of the current project allows.

In order to solve this dilemma, the study adapts a pragmatic approach and focuses on “experienced barriers”. The rationale behind focusing on “experienced barriers” is that whenever a company experiences a barrier, the barrier can be expected to affect the actions and priorities of that company. In that sense, even barriers caused by lack

of knowledge, competencies or by incorrect understanding of the legal texts and procedures are “real” barriers and thus relevant for the purpose of the study. Naturally, in case we discover, suspect or know for a fact that any of the experienced barriers are caused by misunderstandings or wrong interpretations of the legislation, this will be taken into account when analysing the barrier.

Below the central types of experienced barriers are described.

3.2 Types of experienced barriers

The cause of the barriers experienced by the companies varies greatly. Some barriers seem to be caused by a lack of knowledge and/or competencies on behalf of the authorities and/or companies, others by the specific interpretation, enforcement, case processing or administrative practise of the supervising authority, and yet others again by explicit prohibitions, requirements and/or lack of clarity in the legislative texts themselves.

The practice of utilising biowaste exists at the intersection of different policy domains, each with their own aims, methods and processes. Utilising biowaste as a resource is not the primary function of these legislative domains: the applicable legislation is not designed to aid the utilisation of biowaste. In trying to utilise biowaste, actors have to comply with these regulations, and this presents two immediate barriers to utilisation: 1) actors need to be aware of, comply with and administer for several overlapping policy domains representing a cognitive, technical and administrative burden, and 2) these policy domains are insufficiently flexible to facilitate the better use of biowaste and apply blanket regulation to serve their own specific goal – protection of the environment or food safety for example. A third point, addressed below as specifically relevant for the planning and construction of biowaste treatment facilities, is that there is no single, reliably applied, set of environmental and permitting criteria applied for the given legislation.

Two types of barriers stemming from the legislative framework can be identified. Those barriers that are intended and that fulfil the goal of the legislation, and those barriers that do not serve the goal of the legislation. As utilisation of biowaste exists at the intersection of legislative domains concerned with issues other than the utilisation of biowaste, so it is unsurprising that these legislative domains contain a number of unintended legislative barriers to the utilisation of biowaste.

The second type of barrier – the unintended barriers – can be characterised as one of, or a combination of, the following:

- Forbid actions that do not contravene the primary aim of the legislation (A).
- Increase costs (primarily through increased administrative demands) (B).
- Increase uncertainty and/or timelines (C).

This classification can be used to help find suitable solutions. The first type can only be addressed through changes to legislation, or by addendum exceptions to the relevant legislation, whereas there will typically be some room for addressing the two others through adaptation of more streamlined procedures and an increased information effort.

While individually many of the identified barriers are surmountable, the combined effect of the several, interconnected and complex barriers, is to significantly limit the current and future utilisation of biowaste.

4. Barriers and solutions

The majority of the identified barriers are variations of a number of recurring barrier themes or general issues, while others are more singular in nature – ranging from the specific to the curious.

In this section the major, recurring barriers are described with special focus on the regulations, authorities and countries they relate to, the consequences they have and potential solutions, as proposed by interviewees or others.

The letters and number in the parenthesis after the barrier titles refers to the identified barriers as listed in Appendix 5. The letters are country codes and the numbers refers to the interview and barrier numbers.

Some barriers are related to a specific use of the biowaste e.g, use as feed or use as fertilizer, while other barriers work across these boundaries as illustrated in Table 4 below. Barriers related to the existence and establishment of treatment facilities are described separately.

Often a certain activity is covered by more than one regulation – for instance the Animal By-Product (ABP) regulation and the Sludge regulation, have different rules on treatment of food waste. This can create confusion, and makes it more difficult to be sure that all regulation is taken into account. This is referred to as layered regulation.

For certain uses, for instance as feed, and for certain fractions such as ABP, traceability is required. This means that the origin of the waste must be documented throughout the value chain

Table 4: Overview of barriers

	Layered/unclear legislation	Administrative burdens	Varied enforcement
Feed	Difficulties with ABP	Traceability	
Fertilizer	Sludge regulation ABP Fertilizer regulation	For "unapproved substances"	For unapproved substances
Treatment facilities	Environmental permission	Due to lack of clarity and varied enforcement	Environmental permission
Public private issues	Unclearity on definition as waste		
Food	Food safety		

Overarching barriers will be described with the specific utilisation they are related to, but will also be discussed separately.

The connections between the barriers in a field and their possible solutions are illustrated graphically at the end of the description of each barrier category. However,

in order to illustrate the complexity and interconnection of different barriers and solutions, there is not always full consistency between the text and the illustration. The barriers are described in more detail below, clustered under the following headings:

- Barriers for utilisation as feed and the Animal By-Product regulation.
- Barriers for utilisation as fertilizer.
- Barriers related to biowaste treatment facilities.
- Unclear and complex legislation.
- Multiple reporting and documentation systems.
- Varied enforcement and interpretation of legislation by the local authorities.
- Public-private dilemmas.
- Barriers for redistributing food.
- Relevant barriers outside the primary scope of the study.

4.1 Barriers for utilisation as feed and the Animal By-Product regulation

All of the barriers to use of biowaste as animal feed were related to the Animal By-Products regulation. No regulatory barriers in connection with utilisation of vegetable biowaste were found. The Animal By-Product regulation also presents barriers to utilisation as fertilizer, some of which are also described in this segment.

4.1.1 Administrative burdens for Animal By-Product

The Animal By-Product regulation demands documentation of legal disposal for waste. This is considered an administrative burden (SE 3.1; redistributor, SE 5.4; biogasplant, FI 1.1; retail, NO 1.2; retail/supermarket, Desk study DK). One interviewee (FI 6.1; food processor, dairy products), however, no longer experiences the ABP regulation as a barrier.

Description

Dairy companies have a tradition of collecting returns from supermarkets. These count as ABP and are sold as liquid animal feed for pig-farmers. The management requires that a so-called commercial document shall accompany from store to dairy and even from the dairy farmer. This creates an administrative burden on both sides that should be operated smoothly. Animal by-products can also be used for biogas production. ABP legislation also requires that separate tank trucks are used for the transport of ABP and food. This sometimes has absurd consequences. Whey (by product from cheese production) can be transported in order to be further processed as food component, or become animal feed. The only difference is the decision to use ABP or not, but the hygienic status of the tank car is the same (SE. 3.1; food processor, dairy products).

One company stated that this had been a barrier in the past, but that it is no longer a barrier. Currently the utilization of by-products as animal feed runs smoothly. Class 2 by-products are mainly utilized in biogas production. When first introduced a decade ago, the processes according to animal by-product decree were considered as really complicated. However, nowadays the guidelines from the Finnish Food Safety Authority (Evira) are understandable and clear (FI 6.1; food processor, dairy products). A Danish company (DK 7; food processor) and a Swedish company (SE 1; food processor) also state that they do not encounter regulatory barriers. All of the companies who report that they do not experience barriers are large food producers.

Type of barrier

Increase costs (primarily through increased administrative demands), (B).

Consequences

Increased cost for companies and authorities.

Regulations/Authorities

Animal by-product regulation as adapted by national legislation.

National variation

In Finland disposal of ABP is more expensive than disposal of other biowaste according to one interviewee. This has not been reported from other countries.

FI 1: The disposal and treatment of by-products is more expensive than that of normal biowaste. However, in many cases (in small shops) it is not possible to collect biowaste in two fractions and therefore all biowaste management is charged according to by-product fees.

It seems that the severity of this barrier varies between larger and smaller companies, and between companies which have large amounts of uniform products and those with a larger range of diverse products. This is probably because the larger companies with large amounts of uniform product can employ specialists who handle the regulation.

4.1.2 Unclear regulation

Description

The regulation of by-products makes it more difficult to utilize biowaste as animal feed. Companies fear doing something that may break the rules when utilising by-products as feed, so using by-products to make biofuel or compost is seen as a less risky alternative (NO 1.2; retail/supermarket).

Type of Barrier

Mainly increase uncertainty and/or timelines, (C).

Consequences

Waste may be used lower in the hierarchy than necessary.

Regulations/Authorities

Animal By-Product regulation as adapted by national legislation.

Figure 5: Barriers and solutions for use of biowaste as feed and the ABP-regulation

4.1.3 Solutions for use as feed

The focus of the Animal By-Product regulation is to prevent spreading of diseases, not the utilization of biomass as a resource.

A main barrier for the utilization as feed seem to be the complexity of the legislation. Apart from the Animal By-Product regulation, potential uses must comply with the animal feed regulation and the TSE regulation (regulation put in place to prevent spreading of BSE).³ It is our understanding that a number of uses as feed allowed according to the ABP regulation are forbidden according to the TSE regulation.

Both the Danish and the Finnish authorities report that they make a continuous effort to make information on how animal by product may be used as feed available for the stakeholders.

In Denmark it is possible to apply for an alternative system to document traceability, and the authorities are working on an application form that will help companies to provide the necessary information when applying for an alternative system for documentation of traceability. One downside of alternative systems is that they will be a barrier for export of the by-products. Alternative systems for documentation of traceability are a possibility in the EU regulation, but each country decides whether they will accept such documentation.

³ Meeting with Fødevarestyrelsen.

4.2 Barriers for utilisation as fertilizer

Biowaste can be utilised as a fertilizer, usually in one of three ways:

- Direct use on the soil. This is only possible for purely vegetable biowaste – no barriers have been found to this use.
- Composting.
- Anaerobic digestion with biogas production, where the digestate is used as fertilizer.

Since the barriers found have not been differentiated between composting and anaerobic digestion, the barriers are described together.

There is a range of barriers that hinder the use of biowaste as a fertilizer in different ways. The different variation of this barrier is described below.

4.2.1 *Lack of flexibility in approving fertilizer products*

Description

DK 1.1: Annex 1 in the Sludge Regulation lists approved fertiliser products, but has not been changed since 2006. Since then, new residues have come to the market, or the amounts of some residues have increased significantly. Substances that are not listed in Annex 1 must be individually approved by municipal authorities for each individual plot of land. (DK 1.1; reuser, SE 2.1; food processor, Desk DK, FI, SE).

The administrative burden of fractions that are not mentioned in Annex 1 are significantly larger. Each farmer has to have a separate permission, and if one farmer will use the product on several fields, each field must be separately described. The municipal environmental authorities process the application. There is no limit set processing time for permission and additional documentation is often requested.

By application in more than one municipality, it is the impression, that each municipality process the application without using experience and results from other municipalities. This leads to diverse decision in different municipalities.

(Desk study FI) Only such fertilizer products that are included in the national lists or ELY act may be marketed or imported. Several actors within the fertilizer product market consider the market entry of new bio-based recycled fertilizer product as difficult due to heavy administration.⁴ Typically the producer of new fertilizer product must pass at least three separate administrative procedures: 1) Application of type name for the fertilizer product; 2) Notification on the start of activity; and 3) Application of approval for the production facility. These procedures require giving various clarifications containing partly similar information. Also, the notification on the change of activity must contain same appendices as the first application. The processing time

⁴ Centers for Economic Development, Transport and the Environment – the Finnish monitoring authority for environmental legislation.

at the Food Safety Authority for the different applications varies from 3 to 12 months. (Source: Lehtonen *et al.*, 2015).

Type of barrier

Connected to all three types: Forbid actions that do not contravene the primary aim of the legislation, (A), increase costs (primarily through increased administrative demands), (B), and increase uncertainty and/or timelines, (C).

Consequences

Increased administrative burdens both for companies and municipalities. Since there is no time limit for the case processing, the farmer may need to use an alternative fertiliser, because the application of fertiliser must be carried out at specific times of the year.

Regulations/Authorities

The Sludge Act and environmental permits as enforced by municipal authorities.

National variation

Interviewees from Denmark and Sweden have mentioned the problem of having waste streams certified as fertilizer.

Potential solutions

DK1; reuser: Put a procedure in place for adding substances to Annex 1 when they occur on the market as potential fertilizers, and streamline the procedure for materials outside Annex 1, so the case processing can run more smoothly. Municipalities could learn from each other, or the case processing could be transferred to a more central authority. The Danish EPA informs that a new sludge act is under preparation but is awaiting the new fertilizer regulation. One proposal under consideration is that the new sludge act should provide the possibility to add substances to Annex 1 for instance every year or every second year – or when for instance 6–7 new substances awaits approval.

Figure 6: Barriers for use of biowaste as fertilizer

4.2.2 Barriers concerning visible impurities

There are two barriers in this field, which are seemingly opposing each other: on the one hand, the lack of criteria in Denmark is considered a barrier (DK 5.4; biogas plant) and on the other hand the concern that unrealistic purity demands will make it impossible to utilize large amounts of biowaste as fertilizer is also considered a barrier (DK 2.3; biopulp producer). The barriers are however reported from different companies, and the first is concerned with the demand for fertilizer from biowaste, whereas the other has experienced locally enforced criteria (by the municipality) which they consider unrealistically strict.

Description – lack of criteria: (DK 5.4; biogas plant)

Farmers are reluctant to utilize biowaste because the uncertainty of which quality criteria should be adopted for visible impurities. This is mentioned specifically in relation to members of the Dairy farmer organization.

Type of barrier

Decreases the demand – neither (A), (B), or (C).

Consequences

Lower demand for all types of fertilizer from biowaste.

Description – unrealistic demands

(DK 2.3; biopulp producer) Two large sources of biowaste contains visible impurities, which can only be removed automatically.

Source separated household waste: This is sometimes collected in plastic bags, and there is generally some falsely sorted items in the biowaste.

Packaged biowaste from the food industry and retail: It is unrealistic to separate the biowaste from the packaging manually.

These fractions will often be digested or composted together with other substances such as manure, garden waste and biowaste from restaurants, which usually has less visible impurities. This means that the fertilizer product will often be able to meet the criteria for visible impurities, but the individual fractions mentioned above may not be able to meet the criteria. The reason for setting up criteria for input material instead of the final fertilizer product is to avoid promoting the dilution of unwanted substances.

Type of barrier

Can be considered in line with purpose of regulation and partly forbid actions that do not contravene the primary aim of the legislation, (A).

Consequences

If none of the available technologies can meet the criteria, it will not be possible to use a large portion of the available biowaste. There is also a risk of the technologies being

developed to meet the criteria by disintegrating the impurities, so their size is below the limit for visible impurities, but the same amount of e.g. plastic will be present.

Regulations/Authorities

The Sludge Act and environmental permits as enforced by municipal authorities.

National variation

The Danish Sludge Act does not set limits for visible impurities. An amendment setting limits has been prepared but not yet passed. The Swedish, Norwegian and Finnish regulation does comprise limits for visible impurities, however the Norwegian and Finnish rules are based on content by weight, whereas the Swedish rules are based on surface area, which is especially relevant for plastic foils and film (plastic bags etc.) which will have a large surface but a low weight. The Finnish criteria relates to the final fertilizer product, it is uncertain whether the Norwegian rules apply to input material or to the final fertilizer product.

Potential solutions

(DK 5; biogas plants): Pass amendment with limits for visible impurities. The Danish EPA hope to carry out investigation to provide balanced criteria and suitable analysing methods for visible impurities. A possible approach to the “unrealistic demands” barrier could, in our view, be to adopt a “Best Available Technology” approach. Input material could be allowed if it meets the performance of the best available technology, providing the final fertilizer product meets the criteria.

Figure 7: Barriers and solutions for using biowaste as fertilizer related to visible impurities

4.2.3 Arla dairy-farmers will not take sludge from household waste⁵

Description

The Dairy farmers association in Denmark has developed quality criteria, which do not allow members to use sludge from gasification of household waste as fertilizer. (DK 2.5; biopulp producer)

Consequences

Lower demand for fertilizer from biowaste from households, and the need to avoid mixing household waste with commercial waste.

Type of barrier

Can be considered in line with purpose of regulation and partly forbid actions that do not contravene the primary aim of the legislation, (A).

Regulations/Authorities

Quality criteria of the Danish Dairy Association.

National variation

To our knowledge it is only the Dairy Association in Denmark which has these rules.

Potential solutions

We suggest a dialogue with the Dairy Association to find out if quality criteria can be established, that would make household waste as fertilizer acceptable for them. It is the impression of some stakeholders (DK4; industry organization) that the Dairy Association may be willing to change their rules if limits for visible impurities are established.

Figure 8: Barriers and solutions related to the fact that Arla dairy-farmers will not take sludge from household waste

⁵ The quality criteria are often referred to as "the Arla criteria" but are the Quality criteria of the Dairy Association.

4.2.4 *Uncertainties concerning Sludge Act or Livestock Regulation*

Uncertainties concerning the threshold value that determines whether the Danish Sludge Regulation or the Livestock Regulation applies for fertilizers (DK 5.7; biogas plant).

Description

For fertilizers based on less than 25% biowaste and more than 75% manure, the Livestock Act applies; for fertilizers based on more than 25% of biowaste and less than 75% of manure, the Sludge Act applies. The Livestock Regulation is less administratively burdensome than the Sludge Regulation, therefore the company has an interest in having the fertilizer regulated according to the Livestock Regulation. But determining which regulation applies is complicated and relates to 1) whether the used fractions of biomass is classified as waste or not (municipal decision) and 2) the applied test procedures. The percentages are based on the dry weight of the substances, but it is far from clear cut how one can and should measure the dry weight of e.g. source separated biowaste that, per definition, is far from a homogenous fraction.

Type of barrier

Mainly increase costs (primarily through increased administrative demands), (B), and increase uncertainty and/or timelines, (C).

Consequences

Extra administrative burden and requirements (for farmers and the company) which makes it less attractive to use large quantities of unhomogenous waste fractions as input material.

Regulations/Authorities

The Danish Sludge Regulation and the Livestock Regulation as enforced by the Danish EPA, Agrifish Agency and municipalities.

Potential solutions

(DK 5; biogas plant): Measure the percentages ton by ton instead of basing it on the dry weight. That way one could use the total weight of incoming waste and manure. Dialogue with the Danish EPA acknowledges the barrier. It is expected, that a new fertilizer regulation and a revised sludge act will help decrease the impact of this barrier.

4.2.5 *Restriction in organic farming*

Some fractions of biowaste cannot be used as fertilizer in organic farming (DK 5.5; biogas plant).

Description

The Regulation on Organic Production hinders the use of digestate on organic fields if the digestate stems from commercial waste. Source separated household waste is allowed.

Type of barrier

Partly in line with the purpose of regulation, partly forbid actions that do not contravene the primary aim of the legislation, (A).

Consequences

Fertilizer cannot be sold to organic farmers – which means a reduction of demand. It can be a barrier towards treating commercial waste and source separated waste at the same facility.

Regulation/Authorities

The European Regulation on Organic Production as enforced by the Danish Food and Veterinary Administration.

National variations

Only mentioned in Denmark, but originates in EU legislation.

Potential solutions

Investigate which types of commercial biowaste could be used as fertilizer for organic farming, without compromising the integrity of organic farming.

Figure 9: Barriers and solutions related to using biowaste on organic fields

4.2.6 Solutions for use as fertilizer

A number of the identified barriers are expected to be addressed in a new EU fertilizer regulation. In Denmark there are plans to change the sludge act after the new EU regulation is in place, in order to address such issues as visible impurities and the lack of clarity concerning when a fertilizer is regulated under the fertilizer legislation and when it is regulated under the sludge act. It is however expected that barriers will remain and that an ongoing guidance and information effort can help reducing the barriers.

4.3 Barriers related to biowaste treatment facilities

(DK 4.2, 4.3, 4.5; industry organization DK 5.1; biogas plant, FI 5.3; waste manager).

A prerequisite for utilisation of biowaste is the existence of sufficient infrastructure for the treatment of biowaste. Treatment facilities can perform a separation process to reduce the content of impurities potentially combined with pulping in order to produce a substance which can be fed directly into a biogas plant. Treatment facilities can also be biogas plants, composting facilities – or it can be plants carrying out a number of other processes in relation to the utilisation as feed. The barriers identified in this project relate to separation plants, pulping plants and biogas plants.

4.3.1 *Inflexibility and delays in environmental permit processes for establishing new facilities*

Description

When applying for environmental permit, the project must already be planned on a quite detailed level. This is sometimes problematic as there might be limited information available on, for example, the properties of waste that will be treated. (FI 5.3; waste manager) Obtaining the required permits and approval constitutes an administrative burden that delays the building of new treatment facilities.

Type of barrier

Partly in line with the purpose of the regulation, but also forbid actions that do not contravene the primary aim of the legislation, (A), increase costs (primarily through increased administrative demands), (B), and increase uncertainty and/or timelines, (C).

Consequences

Hinder or delay the construction of sufficient treatment infrastructure and facilities.

Regulation/Authority

The municipal authorities and the environmental permit legislation.

National Variation

A named barrier in Finland and Denmark. Not known for Sweden and Norway.

Solutions

Suggestion by project group: Develop a permit procedure, allows some flexibility in input and output materials. Obtaining environmental permits is probably seen as a difficult and time consuming procedure by many industries. However, it could be useful to investigate if there are specific difficulties connected to permits for facilities for treatment of biowaste. Clarification of rules may lead to shorter case processing.

4.3.2 *Short contract periods hinder private investment in treatment plants*

Description

It is only attractive for private companies to invest in treatment capacity, if they can be sure to receive a sufficient amount of waste for a sufficiently long period, to achieve a return of the investment. One stakeholder (DK 4.2; industry organization) reports, that the first municipal tender on biowaste was only for a period of 2 years, which is not sufficient for a private company to invest in the establishment of treatment capacity.

Consequences

Privately owned facilities do not provide treatment capacity for biowaste from households.

Type of barrier

Increase uncertainty and/or timelines, (C).

Regulation/Authority

The municipal authorities and regulation on public tenders.

National Variation

A named barrier in Denmark. The regulation is expected to be similar in Norway, Finland and Sweden.

Solution

This barrier is partially connected to the private-public dilemmas described in more detail in chapter 4.7. The interviewees did not suggest any solutions to this issue, but longer tenders which include incentives for development of the treatment processes and value chains as markets and technologies might provide an answer.

4.3.3 *Publicly owned treatment facilities are not allowed to treat source separated commercial waste*

Description

It will usually be the best solution both environmentally and economically if biowaste is treated as close to source as possible. In some cases, the distance to the nearest privately owned treatment plant can be so long that recycling is not feasible. The barrier is indirectly expressed in (DK 5.6; biogas plant).

Thereby lack of clarity on when a material must be classified as waste and when it can be classified as by-product becomes a barrier. It is further reported (DK 4.4; industry organization), that “the public procurement obligation makes it difficult to establish public-private partnerships in the waste sector”. This barrier is further described under Public-private dilemmas (page 42).

4.3.4 *Municipal ownership of waste incineration plants*

Municipal ownership of waste incineration plants is a barrier to investments in new treatment facilities (DK 4.1; industry organization, DK 5.6; biogas plant; FI 3.3; biogas plant).

Description

Municipalities who have invested heavily in incineration plants have an interest in obtaining sufficient waste quantities. Combined with the mandate they hold to classify whether a substance should be considered waste or not, and in the first case, what waste category it belongs to, hinders the use of biowaste as a resource.

Consequences

It limits the construction of treatment infrastructure, since municipalities that have large investments in incineration plants have little interest in funding and investing in alternative treatment plants.

Regulation/Authorities

The waste regulation as enforced by municipal authorities.

Solutions

See Figure 12: Barriers and solutions related to the regulation of public versus private treatment facilities for an illustration of some of these barriers and their solutions.

4.4 *Unclear and complex legislation*

(FI 3.1; biogas plant, FI 4.1; industry association., SE 2.2, 2.4; food processor DK 5.2; biogas plant).

Description

Many companies, especially waste operators and biogas treatment facilities, describe the legislation or case processing procedures as unclear, complex and unnecessary difficult to understand and comply with. Companies experience that the authorities are also uncertain about how to enforce legislation, which tends to reinforce their perception that the legislation is unclear and complex. Companies experience that some municipal authorities are not sure about how to enforce the legislation and therefore have a tendency to refuse to give permission even when they ought to. A full mapping of this barrier is not possible within this project, but the complexity is illustrated by some of the statements from the interviews below.

In Finland, the central authorities are Centres for Economic Development, Transport and the Environment (ELY, the monitoring authority for environmental legislation), Finnish Food Safety authority (Evira), and Agency for Rural Affairs (authority for the farmers utilizing the products from biogas plants). None of these is willing to look at the entire system and make interpretations e.g. in cases where the regulations are conflicting. Furthermore, the permitting authority (AVI) and the

monitoring authority (ELY) have recently had different views on how the environmental permit conditions should be given. The problems arise when the mandates of the different authorities are not clear-cut, e.g. in relation to environmental approval for treatment facilities (FI 3.1; biogas plant).

The existence of multiple pieces of legislation and multiple supervising authorities creates administrative burdens, grey areas and interconnected barriers for biogas plants. Often the companies' activities fall into the grey areas in between different legislation. Example: The Danish Agrifish Agency or Food and Veterinary Administration regulates the production, The EPA regulates the biowaste and the Food and Veterinary Administration assess whether biomass may be used as feed or not (DK 5.2; biogas plant).

There does seem to be a fixed procedure for measuring and analysing the dry weight of large, heterogeneous waste fractions such as source separated organic waste (DK 5.7; biogas plant).

"in order to run even the smallest facilities vi must handle 15 regulations – on a daily basis. Many [of the regulatory] things are not fit for biowaste and recycling. The Waste Regulation is the point of departure, but that regulation is based on landfilling and incineration and the Sludge Act is based on sludge. We are a "side track" that does not fit anywhere (...) Are we a waste treatment facility or a biogas plant?" (Plant manager, DK 5; biogas plant).

Some companies experience difficulties in getting adequate help and guidance from the authorities in relation to understanding and interpreting the regulation and case processing procedures correctly (SE 2.4; food processor).

A Finnish actor suggests that the status of biowaste in different phases of the value chain should be clarified. For example, compost is considered as waste when delivered from the waste management company; fertilizer products are not considered products. The remaining waste status hinders the utilization of and demand for these materials. And currently there are no national end-of-waste criteria for these materials. The issue is complicated because the legislative framework related to biowaste lies at the intersection of several fields of legislation: waste law, fertilizer regulations, by-product regulations. The regulations pull partly to different directions: waste law pushes to more recycling whereas the other fields of regulation consider more restrictions due to safety principles. Rapid changes in legislation (as seen lately in the field of waste legislation) might also be a barrier for willingness to invest (FI 4.1; industry association).

Type of barrier

Increase costs (primarily through increased administrative demands), (B), and Increase uncertainty and/or timelines, (C).

Consequences

The barrier creates extra cost for the company in relation to hiring competent administrative staff and specialized consultants in order to make sure that the applications process is not delayed unnecessarily. The negative effect of this situation is amplified by the fact that the authorities are under a lot of pressure and therefore do

not have the resources to help and guide in issues that does not fall precisely within their area of responsibility. The company experiences that the “bureaucracy doesn’t work”, and that many of the barriers are interconnected and all mingled up.

More generally it reduces the treatment companies willingness to take in new waste fractions and may hinders new treatment companies to enter the market, because they do not know how and where to find adequate advice.

Regulations/Authorities

Several legislative areas enforced by several authorities.

Potential solutions

This barrier can be addressed on many different levels, where new concepts for EU legislation on secondary raw materials is the most profound, and an increased communication and information effort directed both at companies and municipalities are probably more realistic in the foreseeable future.

Develop an integrated legislation for biogas plants specifically. If the authorities had specialized caseworkers for biomass and biogas issues the regulatory procedures would be faster and more streamlined and uniform across the country. Furthermore it could serve to change the public image of the treatment processes and the end products if the “waste image” was changed into something more positive. This could increase the market potential for biowaste and thus support increased recycling (DK 5; biogas plant).

Figure 10: Barriers and solutions related to unclear and complex regulation

4.5 Multiple reporting and documentation systems

(DK 5.3; biogas plant, FI 1.1; retail, FI 3.2; biogas plant, SE 5.4; retail/supermarket).

Description

Companies that handle and process biowaste are obliged to report and document their activities and the kind and volumes of waste they handle to a range of different authorities. The authorities use many different reporting systems which creates an administrative burden because it takes time and work hours to report the same information using different systems. The different reporting systems do not communicate well and pen and paper reporting is still used in many cases instead of digital reporting (DK 5.3; biogas plant). The reporting and monitoring requirements during operation is not seen as an excessive burden. However, the different monitoring programmes contain largely the same information and recently a third reporting programme has been introduced. This creates unnecessary work load. (FI 3.2; biogas plant). Likewise companies handling by-products experience the multiple requirements for documentation as unnecessary administrative burdens (FI 1.1; retail, SE 5.4; retail/supermarket), as do companies exporting biowaste to nearby, but cross border treatment facilities (NO 2.2; waste industry association).

Consequences

The companies use extra time on administration and feel that they are doing a lot of unnecessary work that could easily be minimized. Furthermore it makes it less attractive for the companies to accept small quantities of new waste fractions because of the bureaucracy involved. Overall this results in less reuse and recycling of biowaste.

Type of barrier

Increase costs (primarily through increased administrative demands), (B).

Regulation/Authorities

The barrier relates to several authorities and systems. E.g. reporting to the fertilizer account of The Danish Agrifish Agency, transport documents, log files and pasteurisation documents to the Danish Veterinary and Food Administration and reporting to Energinet, the by-product regulation and export/import regulation.

National variation

So far different aspects of the barrier have been identified in relation to Danish, Finish, Swedish and Norwegian legislation.

Solutions

The companies suggest to integrate the systems into one general database, from which all authorities can withdraw the data they need. Furthermore the companies urge the authorities to work closer and better together, and to make an effort to make the documentation requirements more flexible and less burdensome. In the solution dialogue with the Danish Food Safety Agency, they point at the possibility within the ABP regulation, to have alternative systems for documentation of traceability

approved by the authorities (see page 42 for a description of barriers and solutions related to the ABP regulation). This may make it possible for the companies to integrate this documentation demand with reporting for other authorities.

4.6 Varied enforcement and interpretation of legislation by the local authorities

(DK 2.2; biopulp producer, DK 4.5; industry organisation, DK 5.1; biogas plant Desk study DK, FI).

Description

Enforcement of the legislation related to biowaste by local authorities is seen as a problem by several companies. In particular, differences in the way in which legislation is interpreted and enforced by the municipal authorities presents a barrier. For example, case processing practices, test practices, waste classification and the requirements in the environmental permits often vary from municipality to municipality. In Denmark the municipalities have huge influence on how biowaste can be treated, in at least two ways:

- *Environmental permits and monitoring.* In most cases the Danish municipalities act as permitting and monitoring authority for companies (except for companies with significant environmental impact). Thereby they have a lot of influence on how the waste treatment companies are regulated and the requirements that must be met.
- *Waste classification.* According to the Danish Waste Act, municipalities are responsible for classifying waste and deciding how the various fractions should be handled and treated. Municipalities are also responsible for deciding whether commercial waste fractions should be classified as waste or not on basis of an assessment of the market potential and possible environmental effect of the fraction.

The municipalities have huge influence on how various fractions of biomass and biowaste are and can be treated. Several of the interviewed companies express frustration over the variation in the municipal case processing they experience. The companies offer a range of potential explanations for this, which, it should be noted, do not necessarily represent the experiences of the municipal authorities. The companies experience that the (municipal) authorities:

Are uncertain about how to enforce the legislation in relation to utilizing biowaste, and lack experience and knowledge about the treatment processes, available technologies etc. (DK 2.3; biopulp producer).

Often have young employees who lacks the experience and specialized competencies it take to interpret and enforce the legislation correctly (DK 4.5; industry organization, 2.3; biopulp producer).

Are afraid to make mistakes and therefore enforce the legislation stricter than necessary when they are in doubt or uncertain about how to interpret the rules (DK 2.2; biopulp producer, 4.5; industry organization, 5.1; biogas plant).

Often need to consult guides and manuals, find inspiration in other countries or ask the national authorities for help, instruction and guidance before making decisions (ibid.).

Inconsistent and misleading municipal case processing hinders the utilisation of biowaste from companies in biogas plants (Desk Study DK). A waste management company that has developed a new business model for handling biowaste in a resource-efficient manner, has experienced that municipalities sometimes will not allow private operators to use biowaste from companies. Likewise, a large retail chain has experienced that variation in formulation and enforcement of municipal regulation hinder new country wide recovery solutions for using biowaste as a resource (Source: NIRAS and the Danish Business Authority, 2015:87, 88).

Type of barrier

Increase costs (primarily through increased administrative demands), (B), and Increase uncertainty and/or timelines, (C).

Consequences

The varied enforcement is especially a problem for companies offering nationwide biowaste services, since they cannot necessarily use the same test procedures, fractions of biowaste or case processing procedures across all treatment facilities. This makes it more difficult in general to establish new treatment facilities or business models, especially for new and small companies. The variation in case processing and test procedures required to obtain permission for treating new fractions of biowaste make it less attractive for the companies to accept new fractions of biowaste, especially if the quantities are small. In general, the barrier prolongs and delays the case processing when applying for environmental permits for new treatment facilities. The variation in enforcement makes it difficult to develop efficient, nationwide waste solutions.

Regulations/Authorities

E.g. the Danish regulations on waste and environmental permits as enforced by the local, municipal authorities.

Potential solutions

Some companies propose to remove the regulatory function from the municipalities and give it to the Danish EPA instead, provided that the EPA is allocated sufficient economic resources to fulfil the task. The solution dialogues indicate that the variation in enforcement can be the result of different local conditions, and there can be good reasons for the variations. Centralizing the case processing will be a political decision, and the authorities can generally not comment on this subject. For example, the Danish EPA have made an extensive guide to the interpretation of the Sludge Regulation to assist the local authorities with interpretation. Similarly, the Finnish Food Safety Authority provides detailed guidance for local authorities in order to avoid this barrier.

Figure 11: Barriers and solutions related to varied enforcement of legislation

4.7 Public-private dilemmas

(SE 5.5; retail/supermarket, DK 4.4; industry organization, DK 5.6; biogas plant, FI 3.3; biogas plant, FI 5.1; waste manager).

There exist a whole complex of barriers concerning the interface between public and private institutions. The barriers are often interconnected, and there is often uncertainty about the possibilities to overcome the barriers.

Description

The barrier often concerns the possibility to treat residues and waste from households and from commercial entities in the same facility, and to a certain extent to transport it together. One stakeholder (FI 5.1; waste manager) points out, that the need for biowaste treatment plants in densely populated areas is not taken into account by town planning, which may also have its roots in the public – private dilemma. This problem manifests itself in several ways:

Public procurement rules makes private-public partnerships difficult (DK 4.2, 4.4; industry organization).

Public private partnerships are a good way to finance new treatment facilities but the regulations of such enterprises leaves very little room for manoeuvre. In particular, the municipalities' obligation to make a tender for the source separated waste makes it difficult to establish partnerships, since another actor might take over the contract each time it is put on offer (Ibid.).

If a commercial residue is categorized as waste, it cannot be treated in a municipality owned treatment facility (DK 5.6; biogas plant).

Unequal demands for privately owned and publicly owned treatment facilities (stricter for private than for public) (FI 3.3; biogas plant).

Municipal ownership of household waste and possibility to offer services to commercial sector (5.4; biogas plant).

Consequences

Difficult to exploit existing infrastructure, to efficiently expand the infrastructure, to provide efficient collection and transportation, leading to increased cost, which decreases the incentives to utilise the biowaste.

Regulation/Authorities

National Waste Regulation as enforced by municipalities.

National variations

This barrier seems primarily to be a problem in Denmark, Sweden and Finland – it has not been mentioned in Norway.

Potential solutions

The interviews do not provide clear suggestions. In the public debate the public sector typically suggest that they should be allowed to handle more public waste and the private sector typically suggest that more waste should be handled by the private sector.

Figure 12: Barriers and solutions related to the regulation of public versus private treatment facilities

4.8 Barriers for redistributing food

(FI 2.1 2.2; food processor, DK 3.1; redistributor, FI 2.3; food processor, NO 1.3; retail) and Desk study DK EU.

Other projects, (including TemaNord 2016:502 Food redistribution in the Nordic countries and TemaNord 2016:523 Food waste and date labelling) have already thoroughly investigated redistribution of food. As such, this project will not address these barriers in depth. However, the barriers identified through desk study and interviews are reported here.

4.8.1 Food safety regulation and liability issues

Food safety regulation and liability issues limit the redistribution (FI 2.1, 2.2; food processor).

Description

Insecurity about food safety issues and liability (will the donating company be held accountable for the food safety after donation of food).

The regulatory requirements related to allergens and food safety are tightening. The current legislation does not fully cover the issue (e.g. what kind of labels are required) but especially the authorities in the Nordic Countries have applied tight standards. The most recent Nordic allergen research suggests that the industry must pay increasingly attention to the allergens in their processes (FI 2; food processor).

Consequences

The easiest and most secure route for many streams (e.g. dough waste, bread, leftover food, re-called products) is the utilization as bioenergy (biogas or bioethanol) instead of human consumption or animal feed. However, utilisation as bioenergy is lower on the waste hierarchy than re-use (as food or fodder), which in most cases would be a far more resource efficient option and provide more value from the material.

Regulations/Authorities

Food safety and allergens: Finnish Food Safety Authority and respective authorities in other countries. EU regulations.

Solutions

Clarify rules for food safety and liability.

4.8.2 Lack of tax refunds hinders redistribution

(NO 1.3; retail Desk study DK, EU).

Description

There is no tax refund when food is donated to charity, but there is a tax refund for food that is destroyed (i.e. sugar taxes).

Consequences

This creates an incentive to destroy the food rather than redistribute it.

Legislation/Authorities:

The tax legislation and authorities.

Solutions

Give tax refund for donated food as well.

4.8.3 *Food safety regulation*

Food safety regulation prohibits the distribution of surplus food from private consumers (DK 3.1; redistributor).

Description

Food redistributors are not allowed to redistribute surplus food from private kitchens, e.g. leftovers from family reunions, birthday parties and Sunday barbecues. The food legislation as enforced by the Danish Veterinary and Food Administration does not allow for this due to lack of control over food quality.

Consequences

Edible food is discarded instead of being redistributed.

Regulation/Authority

The food legislation as enforced by the Danish Veterinary and Food Administration.

National variation

Expected to be the same in all 4 countries.

Solution

Allow redistribution at the consumers own risk (company suggestion).

4.8.4 *Increased administration burden from donating food*

Description

There are demands regarding handling and documentation of food to be donated. Sometimes this makes it more time consuming and thus expensive to redistribute and donate food than to discard it as waste. Making the administration of donated food less burdensome could reduce the amount of edible food being discarded as waste (Source: NIRAS and the Danish Business Authority, 2015: 97).

Solutions

The Danish food authority has developed a guide for companies who wish to donate food – this approach could be adopted by other countries, and other regulation areas.⁶

4.8.5 Solutions for redistribution of food

Stakeholders suggest that it should not be more expensive for the company to donate food than to discard it as waste – however, if donating food is at a very low cost, an incentive to avoid food waste can be lost.

The Finnish Food Safety Authority publish a guidance document “Ruoka-apuun luovutettavat elintarvikkeet” (Food given to food aid), which provides guidelines for food distribution.

In spring 2016, some members of the Finnish parliament proposed an amendment to the food law. According to the proposal, there would be a conditional obligation for shops, bakeries, communal and other food suppliers to hand over their left-over food suitable for human consumption to food aid or to distribute it themselves. The initiative is currently being processed by the parliament and the relevant ministry will consider whether a government bill will be issued. The retail sector is against the initiative, and considers the voluntary mechanisms as more efficient (Source: Helsingin Sanomat, 2016).

4.9 Relevant barriers outside the primary scope of the study

The interviews have shed light on a number of barriers that are not “formal, institutional barriers” in any strict sense and thus are outside the scope of the study. They are never the less briefly described below. Some of these barriers are semi-institutional, while others are not, but still need to be taken into account when seeking solutions to minimize the institutional barriers.

4.9.1 The cultural perception and natural properties of waste

(FI 4.1; industry association, DK 5; biogas plant).

Description

A number of the regulatory barriers are amplified by the fact that waste treatment companies operates at the end of the value chain and often are required by the authorities to process the biowaste quickly in order to avoid odour nuisance etc. Delays or prolonged case processing when applying for permission to process new fractions often mean that the biowaste or biomass is rejected. (DK 5; biogas plant), Delays in obtaining permits for use as fertiliser may mean that the farmer must use an alternative fertiliser, if the permit is not obtained at the time when the fertiliser must be applied to the soil.

⁶ <https://www.foedevarestyrelsen.dk/Selvbetjening/Guides/Sider/Saadan-kan-virksomheden-undgaa-madspild.aspx>

Description

The way in which waste and especially biowaste is perceived constitutes a barrier for its utilization. Companies experience that classification as waste lowers the demand for the recycled materials. Therefore the status of biowaste in different phases of the value chain should be clarified. E.g. compost is considered as waste when delivered from the waste management company: fertilizer products are not products. The “waste” status hinders the utilization of and demand for these materials. There are currently no national end-of-waste criteria for these materials. The waste status is considered as a risk and the image is poor among potential customers (FI 4.1; industry association).

“We are perceived as a dirty and badly smelling technology. We should be lifted up. If that perception could be changed it would be great. From sludge to biofertilizer. And the same for waste. Because it’s waste, people believe it’s dirty and that nobody knows what it is. But we know exactly what it is (manager, treatment plant, DK 5; biogas plant).

The company experiences that, when they are in contact with the authorities, it make a big difference whether the substances they seek permission to receive and process are articulated as “waste” or “biomass”. This, maybe indirectly and unintentionally, affects their assessment and case processing (Ibid.).

Clearly, changing the cultural perception or natural properties of biowaste is rather difficult. The companies hope that changing the legislation by creating a separate regulation for biogas plants and improved technological solutions could improve the current negative image of biowaste.

Potential solutions

A common theme in the waste sector (across all types of waste) is that materials which can be recycled should not be considered waste but secondary resources. One suggested approach is that only material for landfill, destruction or waste-incineration should be considered waste. Another approach could be to adopt end-of-waste criteria.

4.9.2 Structural-technical barriers

(DK 4.1; industry organization, FI 1.2; retail, FI 5.1; waste manager, SE 5.1, 5.2; retail/supermarket).

Description

Some of the barriers the interviewees experience relate to structural and/or technical issues related to the treatment infrastructure or treatment equipment. Below the different aspects of these barriers are described.

- *Lack of treatment infrastructure and facilities.* Over the course of the last decade the waste treatment system (and legislation) has gradually moved towards an increased focus on resource efficient waste treatment. But while resource efficiency, recycling and sustainability are rather easy concepts use and discuss as part of the public and political agenda, the infrastructure needed to support this

shift is slower and more difficult and expensive to update. Several interviewees mention lack of nearby treatment facilities as a major problem for utilizing biowaste as resource. As mentioned on page 36, several mention that lack of municipal interest in financing – due to large investments in incineration plants – amplifies this barrier (DK 4.1; industry organization, FI 1.2; retail, SE 5.1; retail/supermarket).

- *Town planning lacking behind current need.* Town planning does not support the use of biowaste. E.g. in metropolitan areas there are no spaces planned for biowaste treatment facilities even though there is a need to treat waste close to where it is produced. A lack of logistically viable locations for treatment plants, hinders investments in biowaste treatment capacity (FI 5.1; waste manager).
- *Lack of adequate treatment technologies.* There is no plant nearby that can strip away packaging so the biowaste cannot be used in the nearby biogas plant (SE 5.2; retail/supermarket).

4.9.3 *Insufficient regulatory demands and incentives for using biowaste as a resource*

(DK 2.4; biopulp producer, NO 1.1; retail supermarket, NO 1.4; retail supermarket, NO 2.1; waste industry association).

Several companies mention lack of legislation as a barrier to their waste treatment and recycling activities. We have chosen not to include lack of legislation in the primary scope of the study, since that would result in the scope being virtually limitless. When companies stress lack of legislation as a barrier they point to a lack in incentive structures that could motivate the various actors in the food chain to reduce their waste, sort it better, and deliver it to the best possible treatment processes.

- *Lack of legislative demand on the quality of the biowaste.* One problem reported, for example, is that supermarkets have been known to dispose of mixed waste cheaply by delivering it as biowaste (DK 2.4; biopulp producer).
- *Lack of national regulations to sort biowaste.* It is cheaper to send biowaste to incineration, especially in areas without proper waste handling sites. Often companies must transport biowaste over long distances in order to utilize it as biofuel, and consequently there is little motivation to do so (NO 1.1; retail supermarket, NO 2.1; waste industry association).
- *Lack of incentives preventing incineration of biowaste,* for example an incineration fee/tax (NO 1.4; waste industry association).

Potential solutions

Some companies suggest more legislation (or taxation) as a possible solution to reduce the quantities of biowaste and increase the sorting quality. The legislation could target mandatory sorting and demands for the quality of the sorting.

5. Solutions

The desk study identified 13 barriers, while 66 barriers were identified through interviews. Most of the barriers found in the desk study were also found in the interviews, but the interviews provided a broader and more detailed picture of the barriers.

Some barriers can be addressed on a national or local level whereas others must be addressed through EU, as illustrated below.

Figure 13: Different levels for implementation of solutions

Only a few of the identified barriers can be addressed by a single national agency – and even in those cases, a cooperation with other agencies is expected to provide better result.

It seems that results can often be achieved without actually changing regulations, but by reducing administrative burdens, and increasing information and guidance for companies and local authorities.

One way to organize this effort could be to set up a task force with representatives from relevant agencies, industry organizations and the organization of municipalities. The task force could function at the communication point, both for finding the most relevant topics to focus on and for dissemination of clarifications and information.

On a longer term, the task force could also gather knowledge about where EU regulation is not sufficiently integrated or is contradictory, and use this knowledge to influence future EU regulation. Another issue on EU level is legislation which is not

suited for the transition towards a circular economy. The task force could also provide valuable knowledge with the goal of influencing the EU regulation in this field.

Cooperation between task forces in the Nordic countries could provide valuable experience sharing and contribute to a common Nordic approach to influence EU regulation.

The solutions are described in further detail below.

5.1 The Nordic, national and local level

Although a lot of the barriers have their origin in EU regulation, there are still possibilities to decrease the impact of the barriers on a Nordic and national level.

- Some EU regulation opens the possibility for national variations, for instance by allowing alternative traceability systems, approving new substances for simplified case processing when used as fertilizer. This allows the national implementation of EU regulation to be adapted to the national conditions.
- Increased cooperation between environmental, agriculture and food safety authorities.
- Increased information effort, addressing both companies and local authorities.

5.1.1 Increased cooperation between agencies

Since many of the barriers have an element of overlapping regulation, and are covered by regulation from several sectors (environmental, food, agriculture, and business), a coordinated effort is anticipated to have the largest impact. Some of the areas which could be addressed are listed below.

- *Same terminology:* One suggestion from the solution dialogues is to ensure consistency in the terminology used across all legislation. More uniform terminology is expected to decrease confusion and thereby reduce administrative burdens and lead to more uniform enforcement.
- *Clarification:* In many cases, increased cooperation between agencies will be necessary to provide clarification, especially when an issue is covered by several different pieces of legislation. One area which is in need of clarification: under what circumstances different types of waste or by-products can be handled in publicly owned treatment facilities.
- *Guidance and information:* In the current situation, many companies need to communicate with several agencies to ensure that they are acting in accordance with the regulation. They report that they often receive contradictory information from the authorities, or that the different agencies find the questions outside their domain. An entity which provide information and guidance across different regulations and

sectors could contribute to the reduction of this barrier. This entity could also be used to provide knowledge on where there is an urgent need of clarification.

- *Cooperation with industry organisations:* Industry organizations usually have considerable knowledge about the problems their members encounter, and experience in providing information for their members in a relevant form. Engaging industry organizations could focus on helping small and medium sized companies to overcome the barriers, since the barriers seem to have larger effect on small companies than large companies.

Resources

Time must be allocated for the cooperation between agencies. On a longer term, the resources spent on the collaboration may be saved through a reduction of duplicate work.

Expected impacts

This approach is mainly expected to address barriers which increase costs (primarily through increased administrative demands), (B), and increase uncertainty and/or timelines, (C). Since the approach can also provide increased clarity, it could also be perceived as a reduction in the barriers that forbid actions that do not contravene the primary aim of the legislation, (A). This is expected to make utilising new fractions and fractions of relative limited amounts more attractive, and to make it easier to use material higher in the value chain. Another impact could be the identification of activities that were believed to comply with the regulation but do not, in fact, comply with the regulation. In some cases, this will be in line with the purpose of the regulation.

Risks

It may not be possible to significantly reduce the experienced barriers, or that even if barriers are reduced, this may not lead to a significant increase in utilization of biowaste.

5.1.2 *Alternative documentation of traceability for ABP*

The EU regulation on Animal By-Products provides the possibility for allowing companies to obtain approval for alternative systems for documentation of traceability. In the solution dialogues, the Danish Fødevarestyrelse informed that they are currently working on an application form that will make it easier for the companies to provide the necessary information. Alternative documentation systems for individual companies will probably only be relevant for large companies. The benefits will only reach smaller companies if waste handlers apply for and use an alternative system, or if industry organizations organize alternative systems for their members.

Resources

Agencies responsible for food and feed security provide an operable application procedure, and inform companies, and industry organizations about the procedure. Industry organizations inform their members about the procedure and can set up alternative systems for their members, and assist in decision and application processes.

Expected impact

Reduce administrative burdens in connection with traceability of animal by-products and streamline documentation with other obligations to report to authorities. And thereby making it more attractive to utilize ABP throughout the whole value chain.

Risks

Alternative systems for traceability approved on a national level may hinder import and export of animal by-products.

5.1.3 *More flexible acceptance procedures using materials as fertiliser*

By providing a procedure for approving new materials for use as fertilizer, the regulation can adapt to the market and technological development. This is to some extent an example of "Regulation for the future", but in a specific area, which should be achievable in a relatively short time.

Resources

Environmental protection agencies to set up procedures for approval of materials and communicating the possibility.

Expected impact

Relieve a number of materials from the administrative burdens and insecurity (B and C) connected with obtaining permits described in barrier 1 in 5.2.

Reduce administrative burdens for both companies and local authorities. Increase utilization of a wider range of biowaste types as fertilizer.

Risks

Approval of substances which later proves to be problematic – however this is also a risk with the current system, although smaller amounts are approved in each approval process.

5.1.4 *Provide criteria for visible impurities*

Denmark currently has no criteria for visible impurities and there are large differences between the criteria in Norway, Finland, and Sweden. The criteria should comprise: a definition of visible purities concerning materials and particle size; threshold values, by weight, volume or surface; and methods for analysing the content of impurities. The criteria should balance environmental protection farmer acceptance, with the possibility to use major biowaste streams. Since the other Nordic countries have criteria, it would be obvious to investigate their experiences.

Resources

The Danish EPA to carry out investigations and set up criteria.

Expected Impact

A larger demand for biowaste for fertilizer.

Risks

Criteria that is overly strict, will hinder utilization of biowaste, while overly weak criteria will not contribute to expanding the market. Material analysis can be difficult to carry out. Fractions like source separated household waste are very heterogeneous and it will not be possible to analyse the content of visible impurities until the waste has been pulped.

5.1.5 *New tender concepts*

Traditional public tenders often have the dilemma: companies need a fairly long contract period to achieve reasonable return of investment, while municipalities (and waste producing companies) are reluctant to be tied to the same waste service provider for long periods, because it can limit recycling improvements and implementation of emerging technologies and business models. New tender models that include incentives for the companies to improve recycling could help solve this dilemma.

Resources

Cooperation between the associations of municipalities and industry organisations.

Expected impact

Improved economy and increased utilization of biowaste. Increased incentives for investment in treatment facilities, which can help solve the public-private dilemmas.

Risks

Undesired and unanticipated consequences from the incentives.

5.2 Increased integration of EU regulation

Many of the identified barriers have their origin in EU regulation. The national adaptation of EU regulation, in some cases, provides some room for manoeuvre, but it is limited. Some of the solution dialogues with the national authorities pointed to a lack of integration between different sectors of EU regulation as a hindrance to overcome problems with overlapping legislation. Following this, they suggest that the Nordic Council of Ministers should work for further integration in the policy development process in EU. This is of course a long term process.

The Nordic countries could cooperate in efforts to influence EU policy processes and ensure that new regulation complements rather than contradicts or compromises existing regulation.

One company suggested that a specific regulation for biowaste should be drafted. In the solution dialogues, the Danish and Finnish authorities pointed out that this could easily lead to even more complex regulation, because a diverse range of activities would have to be covered by a single regulation. However, better alignment of the legislation was seen as a possibility by the authorities.

Resources

Cooperation between the Agencies can help locate areas which should be more aligned. In the solution dialogues, the Danish EPA informs, that the recent merge between the Ministry of Environment and the Ministry of Food has led to a closer cooperation between the EPA and the agency for food safety. This has increased the awareness of overlapping areas.

A more detailed mapping to identify the most problematic discrepancies between different EU regulations could help focusing the effort. This has not been possible within the framework of this project.

Expected impact

This approach is mainly expected to address barriers which increase costs (primarily through increased administrative demands), (B), and increase uncertainty and/or timelines, (C), but may also, to a certain extent, address barriers that forbid actions that do not contravene the primary aim of the legislation, (A).

Risks

Efforts to integrate regulation may lead to the regulation becoming more complex, or to currently unaffected activities being affected by regulation.

5.3 Regulation for the future

Some of the identified barriers point directly at legislation that is becoming outdated. However, we assume that barriers concerning layered and unclear legislation, grey areas between regulations, as well as difficulties with varied enforcement are, to some extent, linked to an inherent difficulty with legislation for and in transitions.

When technologies and markets evolve quickly, the stakeholders will wish to carry out actions that were unimaginable or unthinkable a few years earlier. For example, one stakeholder suggested that it should be possible for consumers to buy left-over food from other consumers at their own risk: a suggestion which seems to be in harsh conflict with food safety considerations, but may be a reality sooner than we think. Many other future practices will be a lot less controversial, but will meet barriers, simply because they were not thought of – or even imaginable – when the legislation was written.

Biogas plants often treat several substances simultaneously in order to optimize biogas yield. As new technologies emerge, it is very likely that other products – for example, chemicals and protein – will be produced. The development of integrated bio-refineries that can process both agricultural residues and biowaste may well be hindered by current regulation.

5.3.1 *Safety of products*

Regulation for the future could focus on documenting and ensuring process and product safety. This could be a supplement to the more traditional legislation, which sets standards for the types of biowaste that can be used for the manufacture of different types of products. It would also allow new technologies to be approved as they are developed.

Along the same line, the possibility to approve intermediate products which do not meet the criteria for end products could be provided. A “Best Available Technology Approach” could be applied, in order to secure a development towards technologies for the intermediate products which can meet the criteria for the end products. This could e.g. be a viable approach in connection with reducing the barriers related to visible impurities in bio-pulp.

5.3.2 *End-of-waste*

A number of the barriers can be overcome if material is no longer classified as waste. This goes for barriers connected to the use of the material as well as barriers connected to efficient use of treatment facilities and means of transportation. Here, an approach focused on documenting material safety for the intended use, and which has a positive market value, could be a viable approach.

5.3.3 *Private-public dilemmas*

The viability of business models depend very much on local conditions, such as existing treatment plants, population density, distance to agriculture, and type of agriculture. Therefore, approval of business models on a case-by-case basis, based on assessment of whether the business model compromises free competition or are at risk of being supported by taxes or other fees, could better support efficient capacity development.

5.3.4 *Reporting and traceability*

Although reporting and traceability are seen as a burden by many companies, one example of a more flexible regulation is the Animal By-Product regulation, which allows the national authorities to approve alternative systems of traceability. Such an approach could resolve some of the barriers related to this issue.

Resources

Research in criteria and analysing methods to document the safety of different products will be needed, as well as research on how business models with public-private dilemmas can be assessed.

It is believed that close cooperation with industry associations can provide valuable input to focus the effort.

Expected impact

This approach is expected to address the barriers which forbid actions that do not contravene the primary aim of the legislation, (A). It is expected to contribute to acceleration of implementation of new technologies and business models for utilization of biowaste, which will not only increase the use of biowaste as a resource, but also help the Nordic countries to achieve and maintain a leading position in this field.

Risks

Increased flexibility in approval procedures may lead to increased complexity, which can again lead to increased administrative burdens. There may also be issues concerning cross border trade with products derived from biowaste.

6. Conclusion

The barriers to better utilisation of biowaste are diffuse, and the range of solutions complex: there is no silver bullet. A mixture of changes in regulation, improvements in implementation of the relevant regulation, better cooperation and coordination between regulative bodies, and better guidance and information sharing between national authorities, municipal authorities and the business community would together create a more reliable and robust framework for utilisation of biowaste.

Solutions that are anticipated to provide quick improvements and can be implemented on a national or Nordic level within the existing framework of EU regulation include:

- Providing a uniform terminology in different regulations.
- Clarification of issues covered by several regulations.
- Increased guidance and information for both local authorities and companies.
- Alignment of documentation and reporting demands.

These solutions will demand cooperation between different agencies and ministries, since they concern several regulations. Cooperation with industry organizations is expected to be valuable to this work.

A few solutions are connected to specific regulations:

- Possibility for alternative documentation systems for ABP.
- More flexible acceptance procedures for using materials as fertilizer.
- Providing criteria for visible impurities (in Denmark).

The development and use of new tender concepts could increase incentives for investments in treatment facilities and technological development. New tender concepts may also be able to solve some of the public-private dilemmas encountered by municipalities and companies.

In the longer term, barriers stemming from EU regulation can be addressed by attempting to influence the EU policy process, in policy areas where regulation is overlapping, contradictory or hindering utilization of biowaste. Cooperation between the Nordic countries may make such an effort more likely to succeed.

Another long term solution is to provide regulation that is more supportive of market and technology transitions. The current regulation often requires certain processes and allows certain fractions for certain utilizations. Regulation that incorporates procedures for assessing and authorising new solutions could help drive the development of new solutions. Areas where this approach could be useful are:

- Safety of products.
- End of waste criteria.
- Private public dilemmas.

These policy areas are, to a large extent, dependent on EU regulations, which means that significant changes in these areas need to be addressed at the EU level. Policy approaches that ease transition are broadly in line with the EU's Circular Economy agenda, which indicates that there could be broad support for such changes from EU institutions and Member States.

Sammendrag på dansk

Introduktion

Både fra politisk side og fra erhvervslivet ses konceptet om cirkulær økonomi i stigende grad som nøglen til at sikre en miljømæssig og økonomisk bæredygtig fremtid. Ved at føre "end-of-life"-produkter tilbage i værdikæden kan man undgå de miljømæssige og økonomiske omkostninger, der er forbundet med unødigt udvinding af råstoffer, samtidig med at man undgår de miljømæssige og økonomiske omkostninger forbundet med at bortskaffe affald.

Stigende priser på råstoffer, krav fra forbrugere om mere miljøvenlige produkter og nye tekniske muligheder driver kapløbet om at øge ressourceeffektiviteten gennem værdikæden. Erfaringen viser dog, at disse faktorer ofte er utilstrækkelige til at drive virksomheder til at overkomme formelle og uformelle barrierer, der begrænser brugen af affald som ressource.

Lovgivning vedrørende affald er med til at sætte rammerne for udnyttelse af affald som en ressource, men det primære mål er at sikre en sikker affaldshåndtering. For at lette omstillingen til øget udnyttelse af affald som ressource er en grundig forståelse af de formelle barrierer, der hindrer genbrug og genanvendelse, nødvendig.

Denne rapport undersøger de formelle barrierer – som lovgivning (på EU- og nationalt niveau), krav fra myndigheder, skatter, branchestandarder, certificeringsprogrammer – der hindrer brug af bioaffald som ressource. Hindringerne omfatter administrative byrder, økonomiske omkostninger og direkte forbud.

Denne rapport bygger på et omfattende litteraturstudie af formelle barrierer i de nordiske lande kombineret med strukturerede interviews med aktører langs værdikæden for udnyttelse af bioaffald i Norden samt med udvalgte myndigheder.

Barrierer

Litteraturstudiet identificerede 13 barrierer, mens interviewene identificerede 66 barrierer. Hovedparten af de barrierer, der blev identificeret i litteraturstudiet, blev også fundet i interviewene, men interviewene gav et bredere og mere detaljeret billede af disse barrierer.

Årsagerne til de oplevede barrierer varierer meget. Nogle barrierer skyldes tilsyneladende manglende viden og kompetencer hos myndigheder og/eller virksomheder, mens andre skyldes fortolkning, håndhævelse og sagsbehandling eller administrativ praksis hos den ansvarlige myndighed. Nogle barrierer skyldes eksplicitte forbud, krav og/eller manglende klarhed i selve lovgivningen.

Udnyttelse af bioaffald befinder sig i et krydsfelt mellem flere politikområder med egne mål, metoder, processer og bureaukratier. Udnyttelse af bioaffald er ikke den primære funktion for nogle af disse områder, og derved bliver lovgivningen heller ikke designet til at fremme udnyttelse af bioaffald. For at udnytte bioaffald skal aktørerne efterleve disse lovgivninger, og det giver anledning til to barrierer for udnyttelse:

- Aktørerne skal være opmærksomme på, efterleve og administrere flere overlappende lovgivninger, hvilket udgør en videnskæssig, teknisk og administrativ byrde.
- Disse lovgivninger er ikke tilstrækkeligt fleksible til at facilitere bedre udnyttelse af bioaffald og anvender bredt dækkende lovgivning for at sikre deres egne specifikke mål – fx beskyttelse af miljø eller sikring af fødevarerikkerhed.

Et tredje forhold, som er særlig relevant for planlægning og opførelse af behandlingsanlæg for bioaffald, er, at der ikke eksisterer et samlet sæt af kriterier for tilladelser indenfor de givne lovgivninger.

Hovedparten af de identificerede barrierer er variationer over et antal temaer og generelle problemstillinger, nogle barrierer er dog af en mere enkeltstående natur.

Tabel 5 viser et overblik over barriererne, som er beskrevet detaljeret i kapitel 4.

Tabel 1: Oversigt over barrierer

	Uklar og overlappende lovgivning	Administrative byrder	Forskellig håndhævelse
Foder	Vanskeligheder med Biprodukt forordningen	Sporbarhed	
Gødning	Slambekendtgørelse Biprodukt forordningen Husdyrgødningsbekendtgørelsen	For "ikke godkendte materialer"	For "ikke godkendte materialer"
Behandlingsanlæg	Miljøgodkendelser	Manglende klarhed og forskellig håndhævelse	Miljøgodkendelse
Offentlig – privat problematik	Uklarhed om definition som hhv. Affald og biprodukt		
Fødevarer	Fødevarerikkerhed		

Løsninger

Løsningerne til disse barrierer kan undersøges og implementeres på forskellige niveauer. Nogle barrierer kan adresseres på national eller lokalt niveau, mens andre må adresseres gennem EU, som illustreret nedenfor.

Figure 1: Different levels for implementation of solutions

Enkelte barrierer kan adresseres af en enkelt national myndighed, og selv i disse tilfælde forventes det, at samarbejde med andre myndigheder vil give bedre resultater.

Mange af barriererne kan imødekommes uden at ændre lovgivningen ved at reducere administrative byrder, forbedre håndhævelsen og øge informations- og vejledningsindsatsen overfor virksomheder og lokale myndigheder. Denne indsats kunne organiseres ved at etablere en task force med deltagelse af relevante myndigheder, brancheorganisationer og landsforeninger for lokale myndigheder (i Danmark Kommunernes Landsforening). En sådan task force kunne være det centrale organ til at identificere de mest relevante områder for en videre indsats og til at formidle information og afklaring om håndhævelse af lovgivning.

På længere sigt kunne en sådan task force indsamle viden om EU-regulering, der ikke er tilstrækkelig integreret eller giver anledning til paradokser, og bruge denne viden til at påvirke EU's politik og regulering på disse områder. Et andet emne på EU-niveau er reguleringer, der ikke er egnede til en omstilling mod en cirkulær økonomi. Denne task force kunne også bidrage med viden, der kunne være med til at påvirke EU-regulering på dette felt.

Samarbejde mellem sådanne task forces i de nordiske lande kunne bidrage til værdifuld vidensdeling og bidrage til en fælles nordisk tilgang til at påvirke EU-regulering.

Konklusion

Barriererne for bedre udnyttelse af bioaffald er diffuse og løsningerne er komplekse. En kombination af ændringer i lovgivningen, forbedringer i håndhævelsen, bedre samarbejde og koordination mellem myndigheder og bedre vejledning, information og vidensdeling mellem nationale myndigheder, lokale myndigheder og erhvervslivet kan tilsammen skabe mere forudsigelige og robuste rammebetingelser for udnyttelse af bioaffald.

Potentielle forbedringer, der ikke kræver ændringer i lovgivningen, omfatter:

- Sikre ensartet terminologi på tværs af relevante lovgivninger.
- Afklare emner, der er dækket af flere lovgivninger.
- Udvidelse af vejledning og information til både lokale myndigheder og virksomheder.
- Samordne krav til dokumentation og indberetninger.

Nogle løsninger er forbundet til specifikke lovgivninger, disse omfatter:

- Mulighed for alternative dokumentationssystemer til Biprodukt-forordningen.
- Mere fleksible godkendelsesprocedurer for godkendelse af produkter til brug som gødning.
- Etablering af kriterier for synlige urenheder (i Danmark).

Udvikling af nye udbudskoncepter kunne øge incitamenterne til at investere i nye behandlingsanlæg og teknologisk udvikling. Det er også muligt, at nye udbudskoncepter vil kunne løse nogle af problemstillingerne vedrørende offentligt eller privat ejerskab af anlæg.

På længere sigt kan barrierer, der stammer fra EU-regulering adresseres ved at forsøge at påvirke det politiske arbejde i EU. Dette gælder specielt for områder, hvor flere reguleringer overlapper hinanden, står i modsætning til hinanden eller hvor reguleringer hindrer udnyttelse af bioaffald. En fælles nordisk indsats kan gøre det mere sandsynligt, at en sådan proces bærer frugt.

En anden langsigtet løsning er at etablere regulering, der i højere grad støtter udvikling i markeder og teknologier. Den nuværende regulering kræver ofte specifikke processer og tillader bestemte fraktioner til bestemte udnyttelser. Regulering, der omfatter procedurer til at vurdere og godkende nye løsninger, kunne medvirke til at fremme udviklingen af disse løsninger. Områder, hvor denne tilgang kan være nyttig, er:

- Produktsikkerhed.
- "End-of-waste"-kriterier.
- Dilemmaer omkring offentligt eller privat ejerskab af anlæg.

Disse områder afhænger i høj grad af EU-regulering, hvilket betyder at væsentlige ændringer skal foretages i EU-regi. Tilgange til regulering, der letter omstilling, er i overensstemmelse med EU's Cirkulær økonomi dagsorden, hvilket betyder, at der kan være bred opbakning til en sådan omstilling fra EU's institutioner og medlemsstater.

Appendix 1: List of literature

Norway

- Hanne Lerche Raadal, Aina Elstad Stensgård, Kari-Anne Lyng, Ole Jørgen Hanssen; Østfoldforskning. 2016. Vurdering av virkemidler for økt utsortering av våtorganisk avfall og plastemballasje. Report no. M522/ OR.01.16, ISBN: 978-82-7520-739-3.
Assessment of means to increase sorting rates of biowaste and plastic waste. Produced on behalf of the Norwegian Environment Agency (Miljødirektoratet).
- Mepex. 2012. Økt utnyttelse av ressursene i våtorganisk avfall. Rapport nr. ta2957/100 534–834.
Increased utilization of biowaste resources.
- Basis for a white paper (stortingsmelding), on behalf of the Norwegian Environment Agency (Klima- og forurensningsdirektoratet, now Miljødirektoratet).
- SFT – Statens forurensningstilsyn (nå Miljødirektoratet). 2011. Energipotensial i nedbrytbart avfall i Norge. Report no. 2457-2009.
Potential energy of biodegradable waste in Norway. Study preceding the ban on landfills.
- Terje Farestveit, Elisabeth Møyland og Ingrid Aarre Daae; Miljødirektoratet. 2015 Bedre utnyttelse av fosfor i Norge. Rapport nr. M-351.
Report on utilization of phosphorous in Norway.
- Ministry of Agriculture and Food, The Ministry of Climate and Environment, The Ministry of Health and Care Services. 2003. Forskrift om gjødselvarer mv. av organisk opphav.
Regulations on organic fertilizers. Information in e-mail from Trond Knapp Haraldsen, Senior researcher, NIBIO, Norwegian Institute of Bioeconomy Research, (Norsk institutt for bioøkonomi).
- Aina Elstad Stensgård og Ole Jørgen Hanssen; Østfoldforskning. 2015. Matsvinn i Norge 2015 – Status og utviklingstrekk 2009-15. Rapport nr. OR.13.15.
Food waste in Norway 2015 – Status and development 2009-15. Report on behalf of the Matvett AS/ForMat-project.

Finland

- Canali, Massimo; Östergren, Karin; Amani, Pegah; Aramyan, Lusine; Sijtsema, Siet; Korhonen, Otso; Silvennoinen, Kirsi; Moates, Graham; Waldron, Keith; O'Connor, Clementine. 2014.
Drivers of current food waste generation, threats of future increase and opportunities for reduction. <http://www.eu-fusions.org/index.php/download?download=111:drivers-of-current-food-waste-generation-threats-of-future-increase-and-opportunities-for-reduction>
Expert views and a literature review were a basis to inventory and categorize what has been seen as the primary causes of food waste, the aspects which threaten an increase in food waste, and the aspects which suggest possibilities for reduction in food waste in the future.
- Katajajuuri, Juha-Matti; Silvennoinen, Kirsi; Hartikainen, Hanna; Heikkilä, Lotta; Reinikainen, Anu. 2014 Food waste in the Finnish food chain *Journal of Cleaner Production* 73 (2014) 322-329.
<http://dx.doi.org/doi:10.1016/j.jclepro.2013.12.057>
This study focused on mapping the volume and composition of avoidable food waste in the Finnish food production-consumption chain, and demonstrated that around 130 million kg of food waste are generated each year (23 kg per capita/year) from the household sector.

- Motiva. 2014. Ruokapalvelut: Ruokahävikki ja jätteet. Ohje ympäristökriteereistä julkisissa hankinnoissa.
http://www.motivanhankintapalvelu.fi/files/460/Motivan_hankintaohje_Ruokapalvelu_Ruokahavikki_ja_jatteet_15.5.2014.pdf
 A guidance for defining environmental criteria for sustainable public procurement of food services related to food wastage. Includes examples of easily applicable environmental criteria and their verification.
- Motiva. 2015. Päivittäistavarakaupan materiaalitehokkuuden kehittäminen.
http://www.pti.fi/fileadmin/user_upload/tiedostot/Tutkimukset/Muut_tutkimukset/Paivittaistavarakaupan_materiaalitehokkuuden_kehittaminen_Motiva_2015.pdf
 The early measures to prevent food wastage and improve material efficiency were assessed by literature review and by interviewing selected member companies of Finnish Grocery Trade Association.
- Møller, Hanne; Hanssen, Ole Jørgen; Svanes, Erik; Hartikainen, Hanna; Silvennoinen, Kirsi; Gustavsson, Jenny; Östergren, Karin; Schneider, Felicitas; Soethoudt, Hans; Canali, Massimo; Politano, Alessandro; Gaiani, Silvia; Redlingshöfer, Barbara; Moates, Graham; Waldron, Keith; Stenmarck, Åsa. 2014. Standard approach on quantitative techniques to be used to estimate food waste levels. <http://www.eu-fusions.org/index.php/download?download=2:standard-approach-on-quantitative-techniques>
 This report identifies a number of possible quantification methods for food waste, investigates their advantages and disadvantages, for what applications they should be used and present some guidelines on how to use them.
- Pap, Nora; Pongrácz, Eva; Myllykoski, Liisa; Keiski, Riitta L. 2014. Waste minimization and utilization in the food industry: valorization of food industry wastes and byproducts.
<http://dx.doi.org/doi:10.1201/b16696-23>
- Silvennoinen, Kirsi; Heikkilä, Lotta; Katajajuuri, Juha-Matti; Reinikainen, Anu. 2015. Food waste volume and origin: Case studies in the Finnish food service sector Waste Management 46 (2015) 140-145. <http://dx.doi.org/10.1016/j.wasman.2015.09.010>
 The project mapped the volume and composition of food waste in the Finnish food service sector. The amount, type and origin of avoidable food waste were investigated in 51 food service outlets, including schools, day-care centres, workplace canteens, petrol stations, restaurants and diners.
- Silvennoinen, Kirsi; Katajajuuri, Juha-Matti; Hartikainen, Hanna; Heikkilä, Lotta; Reinikainen, Anu. 2014. Food waste volume and composition in Finnish households British Food Journal Vol. 116 No. 6, 2014 pp. 1058-1068. <http://dx.doi.org/doi:10.1108/BFJ-12-2012-0311>
 The study estimated amounts of food waste in households using diaries and weighing.
- Silvennoinen, Kirsi; Koivupuro, Heta-Kaisa; Katajajuuri, Juha-Matti; Jalkanen, Lotta; Reinikainen, Anu. 2012. Ruokahävikki suomalaisessa ruokaketjussa: Foodspill 2010-2012 -hankkeen loppuraportti (Final report of the Foodspill project).
<http://jukuri.luke.fi/bitstream/handle/10024/438248/mttraportti41.pdf?sequence=1>
 The aim of this project was to identify the volume of Finnish food waste, and its distribution among all parties involved in the food supply chain: households, food services, retail sector, and food industry.
- Silvennoinen, Kirsi; Korhonen, Otso. 2013. Food waste volume and composition in Helsinki region households International conference on life cycle management; 6, Gothenburg, 2013, pp 969-972. <http://conferences.chalmers.se/index.php/LCM/LCM2013/paper/view/742/346>
 The focus of this research is to produce detailed information on amounts and types of avoidable food waste in households using sampling analysis in landfill.
- Silvennoinen, Kirsi; Pinolehto, Marja; Korhonen, Otso; Riipi, Inkeri; Katajajuuri, Juha-Matti. 2013. Kauppakassista kaatopaikalle, ruokahävikki kotitalouksissa: Kuru 2011-2013 -hankkeen loppuraportti (Final report of KURU project). <http://urn.fi/URN:ISBN:978-952-487-464-9>
 The focus of KURU – “Reduction of consumer food waste as a part of food chain responsibility” research project is to produce detailed information on avoidable consumer food waste, its reasons and prevention methods in both households and food service institutions. The amount, type and origin of avoidable food waste were investigated in 51 food

service outlets, including schools, day-care centres, workplace canteens, petrol stations, restaurants and diners.

Silvenius, Frans; Grönman, Kaisa; Katajajuuri, Juha-Matti; Soukka, Risto; Koivupuro, Heta-Káisa; Virtanen, Yrjö. 2014. The role of household food waste in comparing environmental impacts of packaging alternatives Packag. Technol. Sci. 2014; 27: 277-292.

<http://dx.doi.org/doi:10.1002/pts.2032>

This paper examines the environmental impacts of food waste and the influence that packaging alternatives can have on causing food waste. This paper presents the results of three LCA case studies on packed food products.

Silvennoinen, Kirsj; Sinkko, Taija. 2013. The food waste pilot project "Saa syödä!": "Licence to eat" International conference on life cycle management; 6, Gothenburg, 2013, pp 922-924.

<http://conferences.chalmers.se/index.php/LCM/LCM2013/paper/view/742/346>

Presents findings of a pilot project conducted during winter 2012-2013 in Helsinki, Finland.

The aims of the project were to find out whether sharing food with other consumers could reduce food waste and to find out how much and what kind of food people are ready to share with their neighbours.

Sweden

Avfall Sverige. Website: <http://www.avfallsverige.se/avfallshantering/biologisk-aatervinning/certifiering/faq-certifiering/> (2014-12-10)

Description: The website contains FAQ about certification of fertilizers.

Chalmers tekniska högskola: Ljungqvist, H (2008) *Miljö- och samhällsekonomisk analys av behandling av biologiskt avfall*.

Description: A master thesis with analyses which treatment of biowaste is best from an environmental point of view. It also includes an economic evaluation for different treatments.

Different factors that affects the actors who want to treat biowaste are discussed.

Hushållningssällskapet Kalmar: Halldorf, S (2012) *Varför gör inte alla kommuner biogas av sitt matavfall? En pilotstudie i Sydost – Kronobergs, Kalmar och Blekinge län*.

Description: In the study by Halldorf (2012) the question "Why do not all municipalities produce biogas from their biowaste?" is asked. It is a survey of how different municipalities collect and treat their biowaste. The reason for this is due to economy and that the cost of investing in biogas plants is too big. There is also to little cooperation between municipalities.

Högskolan i Gävle: Eriksson, O (2012) *Perspektiv på biogas – en antologi om biogas som drivmedel med fokus på teknik, miljöpåverkan och samhällsnytta*.

Description: Eriksson (2012) describes the use of biogas and its benefits today. It discusses the importance of technology but also how the municipalities can promote the use of biogas.

Different barriers for actors who want to produce biogas are explained also with solutions for the barriers.

JTI – Institutet för jordbruks- och miljöteknik: Ljung, E, Palm, O, Rodhe, L (2013) *Ökad acceptans för biogödsel inom lantbruket*.

Description: The report discusses how fertilizers from biowaste can be certified. There are different criteria to become certified. It also discusses the possibility of international cooperation through "End of Waste" – criteria and that there should be common regulations on fertilizers to benefit trade.

Livsmedelsverket: Widell, S (2015) *Varför används inte större kvantiteter livsmedelsavfall i foderkedjan?*

Description: Widell (2015) describes the different regulations for food-waste and how these affect the possibilities to use food-waste as feed.

Naturvårdsverket: Naturvårdsverket (2012) *Biogas ur gödsel, avfall och restprodukter – Goda svenska exempel*.

Description: The report from Naturvårdsverket (2012) describes the benefits of using biogas and its potential and the technology behind the biogas production. It also presents three good examples of biogas plants. It also describes how the actors who want to produce biogas can get tax relief. The different tax reliefs include energy tax, carbon dioxide tax, energy certificate, investment support etc.

Naturvårdsverket (2004) *Marknaden för avfallshantering*.

Description: The report describes the market situation in the waste area. It is concluded that there are definition problems of what is considered waste and also what type of waste. This is the case between household waste and industry waste, where there is no clear division. It is up to the municipality to decide through their responsibility to establish a waste plan where the divide goes. This causes different municipalities to act in different ways.

WSP: Dahlgren, S, Liljeblad, A, Cerruto, J, Nohlgren, I, Starberg, K (2013) Realiserbar biogaspotential i Sverige år 2030 genom rötning och förgasning.

Description: Dahlgren *et al.* (2013) put forward some different future scenarios for the biogas potential in Sweden. They are based on potential outcome if regulations, taxes and technology are changed or developed.

Denmark

COWI 2015. Analyse af det regulerings- og støttemæssige landskab for biomasseanvendelse.

Endelig rapport. Februar 2015, Naturerhvervsstyrelsen.

Description: Report on regulation and incentives for a wide range of biomass sources including biomass produced for utilization as well as industrial and agricultural residues and biowaste from households.

Gylling, Morten; Toke Radmer Lillethorup & Mikkel Vestby Jensen. 2016. *Organisk affald – Fra husholdninger og servicesektoren samt effekter af nuværende anvendelse*.

Description: The report describes initiatives to promote utilization of biowaste, and does not describe barriers.

Jensen, Jørgen Dejgård. 2011. *Vurdering af det økonomiske omfang af madspild i Danmark 17 maj 2011, Fødevareøkonomisk Institut*.

Description: Report on the economic extent of food waste in Denmark.

Kjær, B. & Werge, M. 2010. *Forundersøgelse af madspild i Danmark*. Miljøministeriet, Miljøstyrelsen. Miljøprojekt, nr. 1325, 2010.

Description: Report on food waste from households. Barriers described are concerning best before- and sell by dates.

Landbrug og fødevarer. 2015 *Madspild i Danmark – Et overblik over undersøgelser og igangværende projekter om madspildet i Danmark*, 23 september 2015.

Description: Report on investigations and ongoing projects on reducing food waste. Barriers primarily concerning food waste from retail.

Lange, Lene. 2012. *Bio "affald" – fremtidens ressource Incl. 10 teser om hvordan vi kickstarter bioøkonomien* (ppt), Aalborg Universitet.

Description: Report on how biomass and biowaste can be used for higher value purposes.

Det Nationale Bioøkonomipanel. 2016 *Organisk Affald – vejen mod en bedre udnyttelse af vores ressourcer*.

Description: Proposing initiatives for promoting improved utilization of biowaste.

Mogensen L., Hermansen J. & Knudsen M.T. 2011. Notat vedrørende: Madspild i fødevarerproduktionen – fra primærproduktion til detail. Notat leveret til Fødevareministeriet ultimo januar 2011.

Description: Report on amounts of food waste from primary production to retail.

NIRAS. 2015. *Reguleringsmæssige barrierer for danske virksomheders ressourceeffektivitet*, Miljøstyrelsen og Erhvervsstyrelsen.

Description: Report on barriers for resource efficiency in companies. Barriers connected to classification of residues as waste is a significant barrier.

The Nordic Region, EU and globally

European Commission. 2010. Preparatory Study on Food Waste Across EU 27. Technical Report – 2010–054.

Description: Technical report from DG Env. Detailed coverage of the causes and quantity of food waste in the EU, but it does not delve into the utilisation of food waste. Or barriers to such utilisation. It also does not address separate collection, as this is deemed an expensive policy option and not one that there was (at the time) sufficient support of evidence to support.

European Environment Agency 2011. A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy.

Description: Overarching EU strategy for resource efficiency and one of the flagship initiatives of the Europe 2020 strategy. Does not specifically mention biowaste, but the approach of recycling and moving up the waste hierarchy is ingrained in the strategy.

COM (2015) 614 final Closing the loop – An EU action plan for the Circular Economy.

Description: Food waste is one of the targeted action areas in the circular economy package. It includes an overarching call for minimising food waste, but also specifically calls for improvements in measurements of food waste, and has a particular focus on preventing food waste, but it also calls for an investigation into regulations that prevent safe, unsold food being used as animal feed.

European Commission 2014. General Union environment action programme to 2020. Living well, within the limits of our planet. <http://ec.europa.eu/environment/action-programme/>

Description: Nothing specific about utilisation of biowaste.

O'Connor, C., Gheoldus, M. & Jan, O. (2014). Comparative Study on EU member states' legislation and practices on food donation. Final report. European Economic and Social Committee.

Description: Report for the European Economic and Social Committee by BIOS and Delloite. Only features Denmark and Sweden of the Nordic countries, but provides a good overview of the legislative barriers to redistribution / donation of food in these countries.

Gjerris, Mickey; Gaiani, Silvia. 2013. *Household food waste in Nordic countries: Estimations and ethical implications* i Etik i praksis No 1 (2013).

Description: Very focused on the reasons that food waste occurs in households and how these issues can be tackled from a sociological perspective. Not much use in the context of this study, but does have some figures for total amounts of food waste generated in each country.

Gram-Hanssen, Irmelin; Ole Jørgen Hanssen; Johan Hultén; Kirsi Silvennoinen; Mads Werge; Åsa Stenmarck and Ane Kirstine Aare. 2016. *Food Redistribution in the Nordic Region. Phase II: Identification of best practice models for enhanced food redistribution*. TemaNord 2016:502.

Description: NCM report on food waste redistribution. One component of this project was to examine the regulatory framework surrounding food redistribution in the Nordic countries. It also touches on the way in which actors in the food redistribution value chain understand and engage with the regulation.

Gustavsson, Jenny; Christel Cederberg, Ulf Sonesson, Robert van Otterdijk, Alexandre Meybeck. 2011. *Global Food Losses and Food Waste. Extent, causes and prevention*. Food and Agriculture Organization of the United Nations, Rome 2011.

Description: Provides an overarching view of food waste at the global level, divided by continent. This divides food waste in Europe by type of food and where in the supply chain the losses occur. Gives a useful overview of potential quantities, but says nothing about barriers.

Hanssen, Ole Jørgen; Per Ekegren; Irmelin Gram-Hanssen; Pirjo Korpela; Nanna Langevad-Clifforth; Kristin Skov-Olsen; Kirsi Silvennoinen; Malin Stare; Åsa Stenmarck and Erik Svanes. 2014. *Food Redistribution in the Nordic Region. Experiences and results from a pilot study*. TemaNord 2014:562.

Description: Key document detailing the regulative barriers to food redistribution throughout the Nordic countries. Particularly pages 35-44. Sole focus on food distribution.

Møller, Hanne; Nina Lødrup; Pernille Lundquist Madsen; Åsa Rosengren and Annika Nurttila. 2015. *Date labelling in the Nordic countries. Practice of legislation*. TemaNord 2015:504.

Description: Interesting, but not particularly relevant; deals with the pros and cons of labelling, which set frameworks for the generation of food waste in household, but does not influence the utilisation of biowaste.

Appendix 2: Interview guide

Below the email version of one of four interview guides is shown. The email guides were adapted to fit different types of stakeholders. The shown example is the interview guide for waste operators.

Information about the interview

Background and purpose

- The study is conducted for the Nordic Council of Ministers and aims at identifying formal, institutional barriers that hinders the reduction, reuse or recycling of biowaste and food waste.
- The purpose of the study is to establish a foundation for developing policies that allows optimal use of biowaste as resource.
- The study focusses on the barriers that companies may encounter in relation to legislation, enforcement, case processing, taxes and duties, demands of reporting, documentation and permits and other demands from the authorities that make it cumbersome, expensive or impossible to use biowaste as a resource.
- We hope you will spend a moment to share your knowledge in this field.

Anonymity

- Quotes and description of barriers will be anonymized when results are made public, unless you wish otherwise.

How to answer?

- You do not have to answer all questions. Some may be irrelevant for you. Only answer the questions that have relevance for your business and experience.

About you

- The name of your company or organization.
- Your name and position.
- I want my replies to be anonymized (*yes/no*).

Your company

Before we start, we want to sure that we have the right understanding of your business.

[Before sending out the interview guide insert a short description of the company's business model, main products etc. (especially the part concerning food and biowaste) based on brief research prior to the interview].

- Is this an adequate description of your company and its' business model?
 - Do you have any additions or corrections?

The barriers

Firstly, we would like to know whether you have encountered barriers or obstacles related to the use of biowaste as a resource in your processes. Both when buying and receiving biowaste and when selling the residue for use. We are especially interested in barriers related to legislation, rules and other practices related to the authorities.

- Have you experienced barriers caused by legislation, the authorities or other formal institutions in relation to receiving and using specific kinds of biowaste in your plant or in relation to selling and making use of the residue?
E.g. rules, administration, demands for permits and documentation, taxes, industry standards etc.
 - If you have, please describe them.
- In your experience, which of these are barriers have the greatest negative impact on the utilization of biowaste? Please list the barriers according to their impact.
- Please describe the barriers in further details.
 - Which processes are being hindered?
 - Which authorities and regulations are connected to the barriers?
- What consequences do the barriers have for your company? E.g. extra administrative costs, more expensive solutions, less willingness to try out new solutions in the future, etc.
- How does this affect the behavior of your company?

Solutions and opportunities

If you have any proposals on how to reduce or minimize the barriers, we would like to hear about them.

- Do you have suggestions on how the barriers you've experienced can be reduced or removed? If you do, please describe.

- Do you have other suggestions as to how to make it easier or more profitable for your company to receive and process food waste and biowaste or to use the residue? E.g. changes in the waste definition, in the case processing of the authorities, or in the requirements related to permits, reporting, documentation, handling etc.
- What do you think it would take to implement the suggestions?
 - Who needs to take action?
 - Are there any problems associated with implementing the solution, as you see it?

Sustainability and resource efficiency

We would like to hear about how your company acts and sees itself in relation to “sustainability” and related concepts.

- In your opinion, do you run a “resource-efficient”, “sustainable” or “green” business?
 - How? Please elaborate.
- Have you tried to implement solutions or processes that could optimize the processing and reuse food or biowaste?
 - If yes, please describe which.
- Have you experienced any difficulties or barriers in relation to this?
 - Are any of these related to authorities or legislation? E.g. case processing, reporting, administrative burdens, permits, duties, etc.
 - If yes, please describe how.

Biowaste, residues and by-products

We would like to ask you in more details about the kinds of biowaste and residues you receive and produce. This might shed light on additional barriers.

- What kinds of biowaste do you receive and process?
 - Who are your main suppliers?
 - Which recovery processes do you use?
 - Who buys your residue products and what are they used for?
- Have you experienced any barriers for utilizing digestate/residue as a fertilizer?

Contact and comments

- Are there anybody else, you suggest we talk to on the issue of receiving, processing and using biowaste as resource?
 - E.g. customers, suppliers, partners, authorities, experts, others?
- Do you have other comments on the issue?

Thank you for your participation.

Appendix 3: relevant authorities and regulations

Denmark

Authorities

- Danish Environmental Protection Agency (*Miljøstyrelsen*).
- Municipal environmental authorities (*Kommunale miljømyndigheder*).
- The Danish Agrifish Agency (*Naturerhvervstyrelsen*).
- Danish Veterinary and Food Administration (*Fødevarestyrelsen*).
- Danish Business Authority (*Erhvervsstyrelsen*).
- Danish Competition and Consumer Authority (*Konkurrencestyrelsen- og forbrugerstyrelsen*).

Legislation

- Danish Waste Regulation (*Affaldsbekendtgørelsen*).
- Municipal Waste Regulation (*Kommunale affaldsregulativer*).
- Danish Regulation for using waste for agricultural purposes (a.k.a. The Sludge Regulation) (*Slambekendtgørelsen*).
- Danish Food Regulation (*Fødevareloven*).
- The Organic Production Regulation (*Økologibekendtgørelsen*).
- Water Sector Reform Legislation (*Vandsektorlovgivningen*).
- Danish Environmental Protection Regulation (*Miljøbeskyttelsesloven*).
- Danish Environmental Approval Regulation (*Godkendelsesbekendtgørelsen*).
- Danish Environmental Monitoring Regulation (*Miljøtilsynsbekendtgørelsen*).

Finland

Authorities

- Centres for Economic Development, Transport and the Environment (ELY, the monitoring authority for environmental legislation).
- Finnish Food Safety authority (Evira).

- Agency for Rural Affairs (authority for the farmers utilizing the products from biogas plants).
- Regional State Administrative Agencies (AVI – the permitting authority for environmental legislation).

Legislation

- Regulation: Waste act 646/2011; Definition of biowaste: Government decree on waste 79/2012.
- Regulation: Guidance document of 28.9.2015 from Finnish Food Safety Authority: "Entisten elintarvikkeiden käyttö eläinten ruokinnassa".
- https://www.evira.fi/globalassets/elaimet/rehut/ohjeet/sivu_12517_1.pdf
- Animal originated food wastes are also regulated by EC by-product regulation (1069/2009) and related acts as well as feed hygiene act (183/2005).

Norway

Authorities

- Norwegian Environment Agency.
- Statens naturoppsyn (SNO).
- Mattilsynet.
- Brønnøysundregistrene.

Sweden

Authorities

- Swedish Environmental protective agency.
- Naturerhvervstyrelsen.
- Swedish National Board of Agriculture.
- Swedish National Food Administration.
- Swedish National Board of Fisheries.
- Jordbruksverket.

Legislation

- Förordning (2006:814) om foder och animaliska bioprodukter (Regulatorns from Jordbruks-verket).

- Avfallsförordningen.
- Miljöbalken chapter 15.
- ABP-förordning.

EU

Legislation

- European Regulation on Organic Production.
- European Regulation on shipment of waste.
- The European By-product Regulation.

Appendix 4: Barrier overview

Tabel 1: Barrier overview

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
DK 1.1	Fertilizer	Sludge Act. Annex 1	Lgl lacking behind		Administrative burdens when using substances for fertilizers which are not on the "positive list" (Slambekendtgørelsen Annex 1)	Slambekendtgørelsen			Reuser
DK 2.1			Uncertainty / imprecise lgl.		Lack of clear interpretation, enforcement and legislation		The municipal environmental authorities		Biopulp producer
DK 2.2	Enforcement and treatment facilities	E.g. environmental permits	Varied enforcement		Varied interpretation of legislation from municipality to municipality. The municipalities have the authority to provide the necessary environmental approval (or not) to the company. The company experiences variation in how the municipalities interpret and enforce the national legislation. That is a problem for companies offering nationwide biowaste services.		The municipal environmental authorities		Biopulp producer
DK 2.3	Purity of bio-pulp	Is the content of impurities measured on input or output - dilution discussion	Unrealistic quality demands	BAT/BREF issue	Authorities lack knowledge of the available technologies. This sometimes results in unrealistic demands that might hinder the company in using biowaste as a resource at all. This is the case if the threshold values for pollution are set unrealistically low at a level that cannot be achieved by the current available technologies.		The municipal environmental authorities		Biopulp producer

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
DK 2.4	Biowaste from retail		Lack of legislation	Out of primary scope. Can be seen as a matter between provider and client or as lack of lgl.	Lack of legislative demands on the quality of the biowaste on the suppliers - customer tries to get rid of waste in a cheap way by delivering it as biowaste		The national environmental authorities		Biopulp producer
DK 2.5	Fertilizer	Arla restraints			Arlagården makes it impossible to use biowaste from private households in biogasplants and spread the residue on the fields	The dairy industry standards	The dairy industry		Biopulp producer
DK 3.1	Food safety	Distribution from private producers			Food safety regulation prohibits the distribution of surplus food from private consumers	Food safety regulation			Redistributor
DK 4.1	Treatment infrastructure	Lack of treatment facilities	Structural	Out of primary scope	Lack of municipal interest in financing (due to large investments in incineration plants) hinders new treatment facilities for biowaste				Branch organization for using biowaste
DK 4.2	Treatment infrastructure	Short contract periods. Difficult to invest in new treatment facilities		There has only been one tender so far	Short contract period (2 year) for the first municipal tender on biowaste make it impossible for private companies to finance and build up capacity to treat it and thus to bid on it.		Municipalities		Branch organization for using biowaste

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
DK 4.3	Treatment facilities (and enforcement)	Environmental permits etc. prolongs the building of sufficient treatment facilities			Permits and approval creates administrative burdens that delays the building of new treatment facilities	Miljølovgivningen	Municipalities		Brancheorganisation for using biowaste
DK 4.4	Private-public partnerships	Public procurement obligation	Private-public		The public procurement obligation makes it difficult to establish functional public-private partnerships in the waste treatment sector	Lov om offentlig-privat partnerskaber			Brancheorganisation for using biowaste
DK 4.5	Enforcement (and treatment infrastructure)	Environmental approval for new treatment facilities	Uncertainty in legislation and/or lack of resources/competencies in the municipalities		Lacking municipal knowledge and experience with this field of business hinders the use of biowaste. The municipalities are not sure on how to enforce the legislation and have a tendency to refuse to give permission if they are insecure on how to interpret the rules.	Miljølovgivningen	Municipalities		Brancheorganisation for using biowaste
DK 5.1	Enforcement	Different test practices for measuring the purity of input waste	Varied enforcement /uncertainty in legislation		Lacking competencies and varied enforcement in the municipalities. There is some variation in how the different municipalities enforce the legislation, eg. In relation to how analysis and tests should be carried out. Often municipalities have young employees without much experience. They are afraid to make mistakes and need to read guides or ask the national authorities for help before making a decision		Municipalities		Biogas plant

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
DK 5.2	Multiple lgl.		Unclearity, gray areas, multiple and overlapping lgl		Multiple legislations creates administrative burdens, grey areas and interconnected barriers. Biogasplants are regulated by a range of Orders and have many supervising authorities. Often the companie's activities fall into the grey areas in between the different legislation. The negative effect of this situtaion is amplified by the fact that the authorities are under a lot of work pressure and therefore do not have the resources to help and guide in issues that are not precisely their responsibility. The company experiences that the "bureaucracy doesn't work", and that many of the barriers are interconnected and all mingled up.	Several			Biogas plant
DK 5.3	Enforceme nt	Multiple reporting demands from different authorities for the same numbers	Administra tive burdens. And grey areas / multiple overlapping legislation		Multiple reporting systems from authority to authority creates extra administrative burdens. The many different reporting systems used by the different authorities are an administrative burden because it takes time and work hours to report the same numbers into the different systems. The systems of the different authorities does not communicate and furthermore pen and paper reporting is still used in many cases instead of digital reporting. "It is the same numbers that are being pushed around"	Several	Several: e.g. the agrifish agency, the envirenmenta l protection agency, food safety agency		Biogas plant
DK 5.4	Fertilizer	Arla restraints	Lgl lacking behind		Outdated Sludge Order hinders biogasification of source separated organic waste, because Arlagården wont accept it as long as there is no requirement for "visible pollution"	Sludge order			Biogas plant
DK 5.5	Organic farming			LHC usikker på om det passer	The Regulation on Organic Production hinders the use of digestat on organic fields if the digestat stems from commercial waste and source separated organic waste.	The Regulation on Organic Production			Biogas plant

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
DK 5.6	Public-private (and waste definition)	The municipalities categorizes a substance as waste or not	Public-private	kommunalt ejede anlæg må ikke oparbejde erhvervsaffaldet	Definition as waste hinders the use of organic fractions/biomass at municipally owned facilities (if classified as organic by-product they may)	waste order / by-product-regulation	Municipalities		
DK 5.7	Fertilizer	Unclearities concerning the threshold value that determines whether the Danish Sludge Act (Slambekendtgørelsen) or Livestock Act (husdyrbekendtgørelsen) applies for fertilizers	Unclearity in legislation		For fertilizers based on less than 25 % biowaste and more than 75 % manure the livestock act applies, for fertilizers based on more than 25 % of biowaste and less than 75 % of manure, the Sludge Act applies. Using fertilizers regulated by the Sludge Acts implies more administrative burdens for the farmers and therefore the company has an interest in having the fertilizer regulated according to the livestock act. But determining which regulation applies is complicated and relates to a discussion of 1) whether the used fractions of biomass is classified as waste or not (municipal decision) and 2) the applied test procedures. The percentages are based on the dry weight of the substances, but it is far from clear cut how one can and should measure the dry weight of e.g. source separated biowaste that per definition is a far from homogenous fraction?).	Sludge act, livestock act, waste act	municipalities, Danish EPA and Agrifish Agency		Biogas plant
DK 6.1		Waste regulatives	Varied enforcement		Some companies have experienced that the rules in some municipalities have not been completely clear. That has created problems. It would be nice with more consistent and uniform rules from the municipalities. That is, more consistent and uniform practices of enforcement and administration concerning the rules in the Waste Act. It could also be beneficial to standardize the containers for storing bio waste in the companies	Waste act	Municipalities	Standardization	Industry association

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
DK 7	no regulatory barriers				The company does not experience any institutional barriers for using biowaste as a resource. In the case of faulty products they are sent to biogasification. The company makes risk assessment concerning the use of sludge as fertilizer on the fields to assess if it could affect the quality of the feed.				Food processor
DK 8					Reuse of food – the barriers are the same for all restaurants related to the food legislation. But the main barriers are more practical	Food safety regulation			
FI 1.1	Byproduct regulation / multiple reporting requirements	Documentation for substances	Administrative burdens		By-product regulation cause administrative burdens	By-product regulation			
FI 1.2	Treatment infrastructure	Lack of treatment facilities	Structural	Out of primary scope	Lack of waste treatment options, especially in rural areas.				
FI 2.1	Food safety				Allergen and food safety issues limit the re-use of material flows in the production processes	Food safety regulation			Food processor
FI 2.2	Food safety				Food safety regulations and animal feed regulations limit the donation of food to charity as well as the utilization as animal feed	Food safety regulation			Food processor
FI 2.3	Food safety	Best before dates			Best before dates cause losses in shops, restaurant kitchens and homes.				Food processor
FI 2.4	Indirect influence	Opening hours		Out of primary scope	The long shop opening hours cause increasing amounts of losses in shops.	Lukkeloven ?			Food processor

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
FI 3.1	Enforcement and biogas plants legal position	Biogas plants are at the intersection of many legislative framework. The mandates of different authorities are not clear, e.g. on environmental approval for treatment facilities	Multiple, overlapping legislations and grey areas		A biogas company operates in the cross-section of different sectors of regulation. The central authorities are Centres for Economic Development, Transport and the Environment (ELY, the monitoring authority for environmental legislation), Finnish Food Safety authority (Evira) and Agency for Rural Affairs (authority for the farmers utilizing the products from biogas plants). None of these is willing to look at the entire system and make interpretations e.g. in cases where the regulations are conflicting. Furthermore, the permitting authority (AVI) and the monitoring authority (ELY) have recently had different views on how the environmental permit conditions should be given.	Several	Several		Biogas plant
FI 3.2	Enforcement	Multiple reporting demands from different authorities for the same numbers	Administrative burdens. And grey areas, and multiple overlapping legislation		Reporting and monitoring requirements during operation is not seen as an excessive burden. However, the different monitoring programmes contain largely same information and recently a third reporting programme has been introduced -> unnecessary work load.	several	several		Biogas plant

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
FI 3.3	Public-private and enforcement (unequal)	Unequal enforcement for municipal versus private treatment facilities	Public-private		Typically the permit requirements are tighter for commercial biogas plants compared to municipal operators (e.g. regarding odour control). Also the monitoring of plants is often on a different level (small scale plants monitored by municipal authorities vs. large scale plants monitored by ELY).	Municipalities and ELY			Biogas plant
FI 4.1	Perception of waste and end of waste criteria	Waste classification	Market related barrier	Out of primary scope	Waste classification lowers the demand for recycled materials. The status of biowastes in different phases of the chain should be clarified. E.g. compost is considered as waste when delivered from the waste management company; fertilizer products are not products. The remaining waste status hinders the utilisation of these materials. There are currently no national end-of-waste criteria for these materials. The waste status is considered as a risk and the image is poor among the possible customers	The legislative framework related to biowastes is in the intersection of several fields of legislation: waste law, fertilizer regulations, by-product regulations.			Industry association
FI 5.1	Treatment infrastructure (and maybe public-private)	Town planning lacking behind current need	Structural	Out of primary scope	Town planning does not support the use of biowaste. E.g. in the metropolitan area there are no spaces planned for biowaste treatment facilities even though there is a need to treat waste close to where it has formed. If there are no logistically viable locations for treatment plants, the investments in biowaste treatment capacity will be slowed down/hindered.		Local authorities		Waste manager (collecting, transporting, treating)
FI 5.2	Fertilizer	CE certification	Administrative burdens	Potential future barrier	The possible introduction of mandatory CE marking for fertilizer products in the future (the reform of European fertilizer regulation) could lead to major additional workload and possibly other difficulties.				Waste manager (collecting, transporting, treating)

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
FI 5.3	Enforcement and treatment infrastructure	Environmental permits	Inflexible case processing		Inflexibility of environmental permit processes. When applying for environmental permit, the project must be planned already on a quite detailed level. This is sometimes problematic as there might be limited information available e.g. on the properties of waste that will be treated.		Local authorities		Waste manager (collecting, transporting, treating)
FI 5.4	Ownership of waste	municipalities ownership hinders optimal use	Public-private		The position of municipalities in the waste sector as included in the current waste law (the municipality owns the household waste, including biowaste and has the right to offer treatment services to commercial actors as well).	Waste law	Municipal authorities		Waste manager (collecting, transporting, treating)
FI 6.1	By-product regulation		Best practice?	Former barrier (beskrives i indledning)	This was a barrier before but not considered as one any more. Currently the utilization of by-products as animal feed runs smoothly. Class 2 by-products are mainly utilized in biogas production. Around 10 years ago when the processes according to by-product decree were developed the related legislation was considered as really complicated. However, nowadays the guidelines from the Finnish Food Safety Authority (Evira) are understandable and clear.		Finnish Food Safety Authority (Evira)		Food processor, mainly dairy products
NO 1.1	Mandatory sorting	Biowaste from retail + lack of treatment facilities	Lacking legislation	Out of primary scope	Lack of national regulations (+ motivation) to sort biowaste. It is cheaper to send biowaste to incineration, especially in areas without proper waste handling sites. The company must consequently transport the biowaste over long distances in order to utilize it as biofuel.	Lack of regulation			Retail/supermarket
NO 1.2	By-product regulation	Use as animal feed	Uncertainty + administrative burdens		The regulation of by-products makes it more difficult to utilize biowaste as animal feed. Companies fear doing something wrong, making biofuel or composting the easier alternative.	By-product regulation			Retail/supermarket

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 1.3	Redistribution	Lack of tax refunds			Lack of tax refunds when food is given to charity, although the tax is refunded when food is destroyed (i.e. sugar taxes).				
NO 1.4	Incentives for incineration		Lack of legislation	Out of primary scope	Lack of incentives preventing incineration of biowaste, for example an incineration fee/tax.				
NO 2.1	Mandatory sorting	Biowaste from retail + lack of treatment facilities	lack of legislation	Out of primary scope	Lack of national regulations (and thereby motivation) to sort biowaste. It is cheaper to send biowaste to incineration, especially in areas without proper waste handling sites (several counties in Norway do not have biofuel plants). The company must consequently transport the biowaste over long distances in order to utilize it as biofuel.				Waste industry association
NO 2.2	Export / multiple documentation requirements	From Norway to Sweden	Administrative burdens	Barrier on the Swedish/importer side?	Export systems are complicated, expensive and take time. There are few biowaste treatment plants in the north of Norway, and export could be a solution. However, biowaste cannot be stored for weeks while waiting for export permits. Changes in Swedish regulations demand one permit per port, rather than one per company. This makes the system less flexible, slower and more expensive.				Waste industry association

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 3.1	Treatment infrastructure	Poor framework conditions for biogas plants in Norway.	Structural/technical	Out of primary scope	Less developed infrastructure = more expensive plants. Less economic incentive to establish plants, and more financial and administrative security in Norway (not sure whether financial aid/incentives will be available in the next fiscal year, and whether the legal framework will secure investment in the plant.		The Ministry of Climate and Environment (Norway) https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency. Norwegian Food Safety Authority	Financial support to the establishment and/or operation of biofuel factories. And More security through national innovation/ investment plans and financial plans.	Waste handler
NO 3.2	Export/import	Export permits and systems.			Export systems are complicated, expensive and take time. Have experienced trouble relating to the definitions of the waste: when exporting to Denmark, the authorities can spend 3-5 months handling an application. They have spent a lot of time deciding whether the shipment should be declared as waste or a commodity.		The Ministry of Climate and Environment (Norway) https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency and the Danish Ministry of Environment and Food. Norwegian Food Safety Authority	Improved systems for export (communication between countries).	Waste handler

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 3.3	Environmental permits	Difficult to get new methods approved			New methods for waste handling must be approved, and the company have lost valuable time, and finally work places to foreign countries because Norwegian authorities could not approve the method quickly enough.		The Ministry of Climate and Environment (Norway) https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency. Norwegian Food Safety Authority	Simplification and integration of regulations .. Improved communication and systems within the national authorities.	Waste handler
NO 3.4	Multiple lgl.	Poor interaction between governmental institutions (within Norway)	Multiple, overlapping legislations and grey areas		The communication and handling of (for example application) cases between different Norwegian ministries and departments is slow and complicated. I.e. when processing a new regulation, every department sees only its own area and a lot of responsibility (to apply for the right things or provide information) is pushed down the system, to a caseworker or the company in question.		The Ministry of Climate and Environment (Norway) https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency. Norwegian Food Safety Authority	Simplification and integration of regulations .. Improved communication and systems within the national authorities.	Waste handler

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 3.5.	Enforcement	Difficult to keep up to date with regulations - Experiencing different enforcement of the same regulations in different regions.	Varied enforcement and complex legislation	Forskrift om animalske biprodukter (biproduktforordningen)	It is easy to lose track of all the different rules and regulations, and to understand them. Changing regulations may take a long time, and new regulations are often not good enough. Reasons for this could be: 1) Lack of knowledge of the practical consequences. 2) "Lost in translation"/ adaptations to local situations may make regulations hard to follow up. 3) Lack of agreement on a "good enough" policy when every department has to approve the same text and are reluctant to accept a certain formulation. 4) Process takes a long time: the regulations could end up with formulations that are too general, with leaves room for interpretations. This In turn can lead to different local authorities enforcing the regulations differently.		The Ministry of Climate and Environment (Norway) https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency. Norwegian Food Safety Authority	Simplification and integration of regulations. Improved information about regulations	Waste handler
NO 4.1		Working the plant on a "full cost" system.	Public-private		The plant is owned by a municipality and run on a "full cost" system (where price is calculated through both regular and variable costs) rather than a market based system. This drives up the running costs, making it difficult (impossible) to compete for additional food waste/resources. In turn, it is a challenge to gain enough waste to ensure a secure production of gas.		The municipality (demand for full cost)	Changing the owner structure of the plant to an intermunicipal company might make it easier to compete for resources. Must be decided by the municipality.	Municipally owned biogas plant

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 4.1	Fertilizer (organic farming)	Distributing/ selling fertilizer to organic farms, due to certification restrictions			Restrictions set by Debio (certification board for organic farming) makes it difficult to promote the solid by-products as fertilizer for organic farms.		The Ministry of Climate and Environment (Norway) https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency and the Danish Ministry of Environment and Food - Norwegian Food Safety Authority		Municipally owned biogas plant
NO 5.1	Public-private	Working the plant on a "full cost" system			The plant is owned by a municipality and run on a "full cost" system (where price is calculated through both regular and variable costs) rather than a market based system. This drives up the running costs, making it difficult (impossible) to compete for additional food waste/resources. In turn, it is a challenge to gain enough waste to ensure a secure production of gas.		The municipality (demand for full cost)		Municipally owned biogas plant

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 5.2	National differences	Different incentives for biogas production in different countries			More costly production in Norway means Norwegian plants often lose resources to foreign countries (waste transported abroad). The waste is usually utilized as a resource, but is transported long distances due to different incentives in different countries.		The Ministry of Climate and Environment https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency (international agreements etc.)	Harmonization of regulations between countries (EU)	Municipally owned biogas plant
NO 5.3	Treatment infrastructure	No incentives/regulations on sustainable handling of industrial waste.	Technical-structural barrier	Out of primary scope	Not all waste is utilized, as it might be less expensive to incinerate it locally than transporting it to a biogas plant (or other waste handling plant).		The Ministry of Climate and Environment https://www.regjeringen.no/en/dep/kld/id668/ / Norwegian Environmental Agency (international agreements etc.)		Municipally owned biogas plant

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
NO 5.4	Fertilizer, by-products	Some difficulties selling by-products as fertilizer.			Transportation costs and farmers being skeptical the by-products due to possible pollution (heavy metals etc. primarily from sewage sludge) may hinder the use of it as fertilizer.	By-product regulation	Norwegian Food Safety Authority (fertilizer)	Changing the fertilization regulation to more easily accept by-products from biogas production as fertilizer.	
SE 1.1	No barriers			Nævnes i indledning at nogle virksomheder oplever forbedret lovgivning og/eller ingen barrierer	No barrierers				Food processor
SE 2.1	Fertilizer		Unclarity + lgl lacking behind		Lack of clear rules for the definition regarding sludge and decision-making for new rules takes too long time"				Food processor
SE 2.2			Overlapping legislation		Several different agencies regulating biowaste				Food processor
SE 2.3	Enforcement and maybe by-product		Administrative burdens	Related to "grey areas" and "multiple legislation"	Traceability too difficult and time-consuming. Traceability is important, but it is could possibly be simplified (from involving several commercial documents for each consignment) without compromising safety.				Food processor

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
SE 2.4			Unclear, administrative practices and multiple, overlapping legislations		Hard to get help from authorities". By experience it is perceived difficult to get help from the authorities to interpret the rules.				Food processor
SE 3.1	Animal by-product (ABP)	Commercial documents	Administrative burdens		Dairy companies have a tradition of collecting returns from supermarkets. These count as ABP and are sold as liquid animal feed for pig-farmers. The management requires a so-called commercial document shall accompany from store to dairy and even from the dairy farmer. Animal by-products can also be used for biogas production. This creates an administrative burden on both sides that should be operated smoothly. ABP legislation also requires separate tank trucks will be used for the transport of ABP and food. This sometimes has absurd consequences. Whey can be transported in order to be further processed as food component, or become animal feed. The only difference is the decision to use ABP or not, but the hygienic status of the tank car is the same.		Jordbruksverket and Livsmedelsverket		Food processor, mainly dairy products
SE 4.1	No barriers			Beskrives i indledning	No barriers				Biogas distributor
SE 5.1	Treatment facilities		Structural	Out of primary scope	There is no biogas plant at a reasonable distance				Retail / Supermarket (with large private label production)

Barrier number	Theme	Detail	Overall issue	Remark	Barrier description	Regulation	Authority	Proposed solutions	Company type
SE 5.2	Treatment facilities		Structural/technical	Out of primary scope	There is no plant which can strip away packaging (then the biowaste cannot be used even though there is a biogas plant nearby).				Retail / Supermarket (with large private label production)
SE 5.3					Uncertainty about the future interpretation of "equivalent waste" inhibits investment in new equipment.	Waste law			Retail / Supermarket (with large private label production)
SE 5.4	Animal by-product (ABP)	Transport documents	Administrative burdens		Transport documents for ABP creates a bureaucracy.- The transport documents for ABP cause administrative burden and bureaucracy. The same material from households does not need any documents.	ABP regulation			Retail / Supermarket (with large private label production)
SE 5.5	Waste legislation		Public-private		The Legislation regarding biowaste is unclear regarding industrial waste and household waste. This leads to two different transports are needed for the waste depending on whether it is industry or household waste.	Waste law			Retail / Supermarket (with large private label production)

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Barriers for utilisation of biowaste

There is an increased focus on ensuring optimal use of the resources of the planet. However experience shows that legislation can hinder the use of the resources from waste.

This report examines the unintended consequences that legislation, enforcement and other formal institutions can have on utilization of biowaste as a resource.

The project consists of three main elements:

- 1) Desk research
- 2) Qualitative phone interviews with relevant actors in Norway, Sweden, Denmark and Finland.
- 3) Solution dialogues with authorities

The barriers to better utilisation of biowaste are diffuse, and the solutions complex. A mixture of changes in regulation, better cooperation and coordination between regulative bodies, and better guidance and information sharing between national- and municipal authorities and the business community would together reduce the barriers for utilisation of biowaste.

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