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Content

Waste of Food and the case of the Swedish Environmental Code

An analysis of the possibilities to reduce food waste with the support of environmental legislation*

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Abstract

The EU Commission proposes that by 2030, Member States (MS) must reduce generation of food waste by 10% in processing and manufacturing, and by 30% (per capita) in restaurants, retail, and households compared with 2020. According to the EU Waste Directive (WFD) MS shall take measures to prevent waste generation, such as reducing food waste. This article describes how the Swedish Environmental Code (SEC, or the Code) can be applied to reduce the amount of waste in the food supply chain. We shift the discussion on food waste from being one about waste management to becoming a question of waste prevention or a resource management issue. Therefore, waste regulation will not primarily be in focus.

A conclusion is that ch. 2. sec. 5 of the SEC implies an obligation for everyone to prevent resource waste, and that one must apply the best possible technology in professional activities to this end. However, the SEC lacks the scope to consider aspects that are unique to the food chain, but which can be important for effective regulation. Therefore, specific rules must also be designed, adapted to the conditions in the food supply chain, as a complement to the current regulation. It is primarily the requirement for food safety that must be met.

In Sweden environmental supervision and food inspection is often carried out by the same agency, but by different personnel. We show how environmental inspectors can apply the SEC in matters related to reducing food waste, in a way that has not been done previously.

Keywords: Resource management, waste of food, food waste, Swedish Environmental Code.

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1. Introduction

1.1 Background

According to statistics from the Swedish Environmental Protection Agency (SEPA)[1], approximately 1.4 million tons of food waste were generated in Sweden in 2022, corresponding to 122 kg per person.[2] In the past, it was considered that the greatest food waste occurs in households, an opinion that has now changed.[3] Just under half of this comes from households and the rest from professional activities.[4] As SEPA puts it, therefore, more of the responsibility for reducing the amount of food waste falls on those who handle food professionally than has previously been assumed.[5] The UN's Food and Agriculture Organization (FAO) estimates that around 14% of the world's food is lost after harvest and up to and including the wholesale level.[6]

A large part of food waste is so-called "food waste that could have been avoided",[7] i.e., wasted food and not only leftovers from preparing food. Food loss and waste occur at all stages of the food supply chain,[8] where commercial decisions often impact their magnitude.

Food production and consumption affect both the climate and biological diversity, and contribute to acidification and eutrophication.[9] In Sweden, food production causes around half of total eutrophication and 20–25% of total climate impact.[10] Food production is also one of the most water-intensive sectors.[11] It is forbidden to deposit organic waste in Sweden,[12] so only minor emissions occur due to food waste management, whereas in many other countries food waste in landfills causes large-scale global warming.[13] Therefore, in Sweden the production phase accounts for the majority of the environmental impact of food. Avoiding production is therefore the best way to reduce this impact.

The United Nations (UN),[14] the European Union (EU),[15] and Sweden have all adopted the goal to reduce 50% of food waste at retail and consumer levels and to reduce food losses along production and supply chains by 2030. In addition, Sweden has set environmental milestone targets on reducing food loss and waste.[16] However, there are no legally binding targets yet.

The Sustainable Development Goals (SDG) were adopted by the UN General Assembly as a part of the UN's 2030 Agenda for Sustainable Development, through which the countries of the world pledged to eradicate poverty,[17] find sustainable and inclusive development solutions,

[1] Naturvårdsverket.
[2] Naturvårdsverket 2024, *Livsmedelsavfall i Sverige* 2022, p. 4.
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] FAO. *The state of Food and Agriculture. Moving forward on food loss and waste reduction*.
[7] *Government bill 2016/17:104*, p. 39.
[8] Juan J. Rojas-Reyes et al., Supply chains represent the activities and agents that bring products from producers to final consumers, including waste disposal. *Heliyn 2024*.
[9] Beatrice Garske et al. Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land. Volume 9, Issue 7 (July 2020)*.
[10] Stockholm Environment Institute. *The nexus of Swedish food consumption emissions in climate, health and fairness*. https://www.sei.org/perspectives/swedish-food-climate-health-fairness/ (2024).
[11] Naturvårdsverket, *MiljöEmmissionsData* 2020, p. 4.
[12] Government ordinance on disposal of waste (SFS 2001:512), sec. 8.7.
[13] Carrie Julia Bradshaw, Law and the Value of Food. *Journal of Environmental Law 2018*. pp. 311–331.
[14] United Nations, *Report of the Open Working Group of the General Assembly on Sustainable Development Goals*. SDG 12.3 requires halving per capita global food waste at the retail and consumer levels by 2030 and reducing food losses along production and supply chains, including post-harvest losses.
[15] EU Directive amending the Directive 2008/98/EC on Waste [2018] (OJ L 150/09) 2018/851.
[16] *https://www.sverigesmiljomal.se*.
[17] United Nations, *Transforming our world: the 2030 Agenda for Sustainable Development*. Resolution adopted by the General Assembly on 25 September 2015. A/RES/70/1.

ensure the human rights of all and generally ensure that no one is left behind after 2030. EU has stated that the SDG's shall be implemented in its policies.[18] SDG 12 aims to ensure sustainable consumption and production patterns, and target 12.3 aims at, by 2030, halve per capita global food waste at the retail and consumer levels, and reduce food losses along production and supply chains including post-harvest losses.

In 2020, two milestone targets for reduced food waste came into effect: By 2025, food losses must be decreased and more must become food; and waste of food, measured as the amount of food waste, must be decreased by 20% by weight per capita from 2020 to 2025.[19]

It has been shown that food waste (in Sweden) has not decreased since 2020, instead remained steady around 122 kg per capita for the years 2020–2023.[20] Considering that the target states a food waste reduction by 20% per capita from 2020 to 2025, inferring a 5% yearly reduction rate, it is obvious that the taken measures do not fulfill the target.

The EU has been criticized for focusing too strongly on reduced amounts of (food) waste,[21] which can mask more fundamental issues such as the need to reduce resource utilization in the food chain (e.g., by not producing as much food). This is because only a part of wasted food resources is classified as food waste in legal terms (and because food waste refers to a physical matter, but waste of food can also refer to personal overconsumption leading to obesity, i.e., metabolic food waste)[22]. An example of this "narrow" legislation is the EU hierarchy of waste prevention;[23] use of unsold food for donation; processing; recovery of unsold food for animal feeding; and recovery into compost for agriculture or energy.[24]

1.2 Purpose

There are strong political incentives to stop waste of food on a global,[25] European,[26] and national Swedish level.[27] In order to accelerate the EU's progress towards SDG Target 12.3, the Commission is proposing to set legally binding food waste reduction targets to be achieved by MS by 2030.[28] By the end of 2030, MS will be required to take the necessary measures to reduce food waste by 10% and food waste in processing and manufacturing by 30% (per capita), jointly at retail and consumption level (restaurants, food services, and households). According to WFD, MS shall take measures to prevent waste generation.[29]

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[18] *https://international-partnerships.ec.europa.eu/policies/sustainable-development-goals_en* (2025).

[19] Naturvårdsverket, *MiljöEmmissionsData* 2020, p. 14.

[20] Naturvårdsverket. *Livsmedelsavfall i Sverige* 2022, 2024.

[21] Laura Gómez-Urquijo, The implementation of EU Legal Framework to Reduce Food Waste: The Case of Spain. p. 7, with sources cited there. *European Energy and Environmental Law Review*.

[22] Niina Sundin et al., The Climate Impact of Excess Food Intake – An Avoidable Environmental Burden. *Recourses, Conservation and Recycling*.

[23] FUSION 2016, The food waste hierarchy is an adapted version of the EU's waste hierarchy. *Recommendations and guidelines for a common European food waste policy framework*, p. 66.

[24] In France, this hierarchy has been introduced into legislation. Art. 1 of law N. 2016-1388, volume V (title IV) of the code de l'environnement. For comments on this see Luis González Vaqué, French and Italian Food Waste Legislation. An Example for other EU Member States to Follow? p. 2. *European Food and Feed Law Review*.

[25] FAO Sustainable pathways, *Food Wastage footprint. https://www.fao.org/nr/sustainability/food-loss-and-waste/en/* (2025-02-25).

[26] *EU Code of Conduct on Responsible Food Business and Marketing Places*.

[27] Maria Gardfjell, *Private member's motion to the Swedish Parliament*.

[28] EU Directive amending the Directive 2008/98/EC on Waste [2018] (OJ L 150/09) 2018/851.

[29] Those measures shall, amongst others, promote and support sustainable production and consumption models (Article 9(1)(a)), reduce food waste (Article 9(1)(g))

There are many reasons for this, including shortage of natural resources and the contribution of food waste to climate change. There is also an ethical dimension which may be expressed as "It is not right to waste food, when so many are starving". In addition, there are economic reasons on private, business, and national level.

The focus of this article is not waste management but waste prevention. To prevent food waste, appropriate and effective means of control are required, with legislation as an important component (but not the only one). However, saving raw materials and other resources is not a goal of food legislation, and food legislation lacks instruments to set such demands on the food supply chain. Although one of the aims of WFD is to reduce the amount of waste.[30] The aim of this article is to show how the rules on reduced resource utilization in the SEC can be used to reduce food waste.

It is the MS that are responsible for introducing national regulations that meet the requirements in the WFD. We believe that the SEC is an example of legislation where there is both a clear objective to reduce resource consumption and a clear material regulation of the issue. The aim of the SEC is to achieve sustainable development, in which prevention of resource waste is central.

Generally speaking, the SEC still lives in a paradigm where the focus is on an end-of-pipe regulation. The life cycle perspective, where emissions in upstream processes are also accounted for, has so far not been a main approach for the SEC.

The SEC is not applicable to food itself,[31] but rather to food businesses, where food is manufactured, processed, sold, used, etc. Therefore, while legislation that is applicable to reduce (food) waste and waste of food exists in Sweden, this legislation is not always specifically written and adapted to the conditions (characteristics) prevailing in the various activities that are part of the food supply chain.

1.3 Materials and methods

The method we use to describe and analyze the legal system is based on the idea that it is possible to distinguish three substantially different overarching functions of legislation, or of a legal system, namely:[32]

A. The objective (aim) of the legislation.
B. The substantive norms (requirement rules) used in the legislation.
C. How the system for enforcement of the substantive norms is built up.

The object may be expressed in the legislation itself, or in the preparatory works. In EU law, it may also be expressed in the recitals, or in the overriding TEU[33]. How and where the objective is expressed can be of crucial importance when it comes to the question of how binding it is. In the SEC, there is a clear example of a legally binding goal; "*the Environmental Code must be applied so that…*"[34].

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and encourage food donation and other redistribution for human consumption and thus prioritise human use over animal feed and the reprocessing into non-food products (Article 9(1)(h)). Beatrize Garske et. al, Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments, p. 9. *Land*. *Volume 9, Issue 7 (July 2020).*

[30] WFD art. 1.

[31] With the exception of drinking water from certain small-scale facilities.

[32] Staffan Westerlund, *Miljörättsliga grundfrågor 2.0*. See also Jonas Christensen, *Rätt och Kretslopp. Studier om förutsättningar för rättslig kontroll av naturresursflöden, tillämpade på fosfor* and Lena Gipperth, *Miljökvalitetsnormer. En rättsvetenskaplig studie i regelteknik för operationalisering av miljömål.*

[33] *Consolidated Version of the Treaty on European Union* [2016] (OJ C 202/3).

[34] SEC ch. 1, sec. 1. Emphasis added. See also *Government Bill 1997/98:45-part 2*, p. 646.

Substantive norms provide information on the type of human behavior that the legislation aims to prevent or promote.[35] Even if there is an ambitious aim for the legislation and properly adapted substantive norms, the aim may still not be achieved if the system lacks an effective enforcement system. Enforcement can, for example, be fulfilled via control or supervision by agencies, via penal law, via injunctions and fines, but also via softer tools, such as information and education. Self-control is another kind of enforcement. The term 'implementation deficit' refers to the difference between the set target and the actual result.[36]

This concept is a way of describing a legal system but can also be a starting point for analyzing errors and shortcomings in such a system. In this article, we use the concept as a method for a structural analysis of the Swedish legislation that apply to wasting of food. In addition to examination of the SEC, we examine the food law in EU and in Sweden and one purpose is to identify goal conflicts.

Christensen (2000) proposed a method which he calls 'flow-oriented regulation' for developing a regulatory system aimed at controlling human actions that affect the flow of various natural resources.[37] Since the method was developed so that the legislative process is based on certain relevant scientific facts, it can largely be regarded as an interdisciplinary method.

Depending on whether the regulation intends to reduce extraction of natural resources, reduce emissions, or control the use of a resource in society or in the ecosystem, the regulation may take place in different parts of the flow of resources. The different kinds of regulations (objectives, substantive norms, and enforcement norms) may also be designed and combined in different ways. To control the utilization of different types of resources, the legislator must also have good knowledge of the specific conditions (characteristics) that apply to the specific resource.

In this article we apply the method to the food supply chain, to investigate how the resource-saving parts of the SEC could be applied to the food supply chain; to identify certain circumstances in the food supply chain that resource management legislation must consider in order to be effective; and to propose such a regulation.

2. Definitions of some key words and concepts

2.1 Same term, different meanings

Terms may have one meaning in ordinary speech or in the natural sciences, but another in a legal context. One reason why terms are used with different meanings in different contexts may be that a certain terminology has been developed for a statistical context, for example, but without considering that the same terms are used in a legal context.

Words can also have different meanings within different legal disciplines, which is why it can be particularly important to clarify the meaning of certain key words and concepts used in this article. "Waste", "food", "food waste", and "waste of food" are such terms, but also the expressions "the food supply chain" and "the food chain". This article is written at the border between food law and environmental law, and there can also be misunderstandings about the meaning of words, depending on the legal discipline in which you operate.

[35] Environmental quality standards, norms of behavior, quotas, and trading systems are types of substantive norms.

[36] Staffan Westerlund, *Miljörättsliga grundfrågor 2.0*, p. 54.

[37] Jonas Christensen, *Rätt och Kretslopp – Studier om förutsättningar för rättslig kontroll av naturresursflöden, tillämpade på fosfor*.

2.2 Food waste

"Food waste" in English can have two different meanings, namely waste of food (a verb) [in *Swedish slöseri med livsmedel*] and food that has become waste (a noun) [*livsmedelsavfall*], which can cause problems. Moreover, these wordings are not infrequently also translated incorrectly or used without thinking about the context. To make matters more complex, even the term kitchen waste [*köksavfall*], which is not the same as food waste, is used in some contexts.[38]

If the aim of a legislation is to reduce food waste by 50%, then the legislator must define what is meant by "food waste". If legislation is introduced with one definition of such a central concept, but the follow-up statistics are based on another definition, then there will be problems in determining whether the legislation was a success or a failure.

The different definitions of food waste have been thoroughly discussed,[39] but the problem still exists.[40] This is illustrated below through some examples of slightly different definitions of food waste or food losses.[41]

Defining body	Term	Definition
FAO[42]	Food waste	*The discard of edible foods at the retail and consumer levels, mostly in developed countries.*
FAO	Food loss[43]	*The decrease in edible food mass at the production, post-harvest and processing stages of the food chain, mostly in developing countries.*
UNEP[44]	Food waste in The Food Waste Index	*Food and the associated inedible parts removed from the human food supply chain in the following sectors: Retail, Food service, Households, where "removed from the human food supply chain" means one of the following end destinations: landfill; controlled combustion; sewer; litter/discards/refuse; co/anaerobic digestion; compost/aerobic digestion; or land application.*

[38] Naturvårdsverket, *Uppdrag att föreslå genomförande av artikel 22 om bioavfall Europaparlamentets och rådets direktiv 2008/98/EG i den svenska lagstiftningen*, p. 57.

[39] See, e.g., Julian Parfitt et al., Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of The Royal Society B*. Carrie Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*. Beatrice Garske et al., Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land, Volume 9, Issue 7 (July 2020)*. Naturvårdsverket. *Uppdrag att föreslå genomförande av artikel 22 om bioavfall Europaparlamentets och rådets direktiv 2008/98/EG i den svenska lagstiftningen*. Jordbruksverket. *Slutrapport om livsmedelsförluster. Resultat och åtgärder för att mer ska bli mat. Rapport 2024:1*.

[40] "Varying definitions and the need for boundaries make it more difficult for both business practitioners and regulatory agencies to comply with the legislation and can lead to conceptual confusion." See Naturvårdsverket. *Uppdrag att föreslå genomförande av artikel 22 om bioavfall Europaparlamentets och rådets direktiv 2008/98/EG i den svenska lagstiftningen*, p. 58.

[41] More examples in: Naturvårdsverket, *Minskat matavfall – miljönytta och kostnadsbesparingar*, p. 8. *Svenska MiljöEmissionsData* p. 15. Ingela Lindbom et al., *Åtgärder för att minska svinn i livsmedelsindustrin. Ett industri- och kedjeperspektiv*, p. 4. Naturvårdsverket 2020.

[42] FAO, *Sustainable Pathways, Food Wastage footprint*.

[43] Some studies distinguish between food wastage produced in the early steps of the food supply chain, called "food losses", and "food wastage" that is produced at the end of the food supply chain, called food waste. Beatrice Garske et al., Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land. Volume 9, Issue 7 (July 2020)*, p. 5, with sources cited there.

[44] UNEP, *Food Waste Index Report*, p. 9.

Defining body	Term	Definition
FUSIONS[45]	Food waste	*Any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed of (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea).*
WRI[46]	*Food loss and waste"*	*Food and/or associated inedible parts removed from the food supply chain.*
SEPA, SFA[47]	*Waste of food [matsvinn]*	*Waste of food is food that is thrown away but could have been sold or eaten if handled differently.*
EU law[48]	*Food waste*	*All food as defined in art. 2 of GFL[49] that has become waste.*
EU law[50]	*Catering waste*[51]	*All waste food, including used cooking oil originating from restaurants, catering facilities, and kitchens, including central kitchens and household kitchens.* (Remark: Catering waste in this regulation is translated as *matavfall* in the Swedish version). Food waste [*livsmedelsavfall*] and catering waste [*matavfall*] are therefore not synonyms[52]).

Both "food" and "waste" are legally defined expressions. Food (or foodstuff) is legally defined as *any substance or product, whether processed, partially processed, or unprocessed, intended to be, or reasonably expected to be, ingested by humans* (etc.).[53] Waste is defined as *any substance or object which the holder discards or intends or is required to discard*.[54] Food waste is also included in the definition of bio-waste.[55]

From a strict EU-legal point of view,[56] food waste (the noun) is then *food which the holder discards or intends or is required to discard*.[57] This defi-

[45] FUSIONS, *Definitional Framework for Food Waste* 2014. (FUSION, an EU research project. Food Use for Social Innovation by Optimising Waste Prevention Strategies (2012–2016).

[46] World Resources Institute (WRI), *Food Loss + Waste Protocol. Food Loss and Waste Accounting and Reporting Standard*, p. 141.

[47] Livsmedelsverket, Naturvårdsverket, Jordbruksverket, *Fler gör mer. Handlingsplan för halverat matsvinn* 2030, p. 8.

[48] WFD art. 3. 4a.

[49] Regulation (EC) No 178/2002 of the European parliament and of the council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety [2002] (OJL 31, 1.2.2002, p. 1).

[50] EU Commission Regulation (OJ L 54/1) No 142/2001. of 25 February 2011 implementing Regulation (EC) No 1069/2009.

[51] Ibid., annex 1.22.

[52] See discussion on this in Naturvårdsverket *Uppdrag att föreslå genomförande av artikel 22 om bioavfall Europaparlamentets och rådets direktiv 2008/98/EG i den svenska lagstiftningen*.

[53] Food as defined in GFL art. 2 GFL. [*Livsmedel* in Swedish].

[54] WFD art. 3.1.

[55] WFD art. 3. 4a.

[56] WFD art. 3.1.

[57] Luis González Vaqué, explains the Italian law, which has its own definition of food waste which, in our opinion, does not match the EU's legal definition at all; "food waste': all food in the food supply chain which is thrown away for business or aesthetic reasons or because the expiration date is imminent, which remains edible and could potentially be used to feed people or animals, and

nition decides how these terms are used in this article and is also the definition used by Eurostat.[58] Note that this definition must be separated from the verb "to waste food" or "wasted food".

Eurostat summarizes the concept of food waste as any food that has become waste under these conditions:

1. It has entered the food supply chain.
2. It then has been removed or discarded from the food supply chain or at the final consumption stage.
3. It is finally destined to be processed as waste.

2.3 Problems and some critical points of view

There are problems with the existing definition of food waste. As SEPA summarizes the situation,[59] food waste is a legal concept, defined in EU legislation. It includes food waste which could have been eaten, inedible parts such as peel and coffee grounds, other residual products that the industry handles as a by-product and sells as animal feed or discarded, and simply food sent to waste disposal. On the other hand, vegetables that are handled on the farm or used as fodder are not food waste but are instead food losses.

In the same way, crop residues could be a food if edible and intended for human consumption according to the definition in EU law. If they are not food, then they cannot become food waste either. Materials that were never food, or never intended to act as food, cannot become food waste in the EU legal sense.

Not all wasted or lost food is waste, and all food waste (the noun) does not have to be wasted food, since, for example, spent coffee grounds are considered food waste. Wasted food thus consists of edible products that have entered the food supply chain, are not eaten (by humans) and have been lost. This lost food can either constitute a waste or a residual product (by-product) that can be used for purposes other than food, such as animal feed. Therefore, food waste can comprise items which include parts of food intended to be ingested (edible food) and parts of food not intended to be ingested (inedible food).

In EU legislation, water is a food as soon as it comes out of a tap intended for drinking water,[60] which means that waste of water in the pipeline network is not included in the concept of food waste, nor is the water flushed in water closets (WC) included. In contrast, in Sweden water is equated with food as soon as it has been taken into a water treatment plant.[61] As the water used in WCs is not intended for drinking, it is not defined as food, but drinking water that leaks from the pipeline network in Sweden should still be classified as food waste. But since the water pipes lead both to the kitchen and to the bathroom, it is therefore not possible to separate these different waters.

The boundaries are not entirely clear. A food is, legally speaking, something that can reasonably be expected to be consumed. But what is edible is in many cases a cultural issue, which then means that what is a food in one cultural context constitutes a waste or at least something inedible in another. One can also discuss whether it is a waste of food to use, for example, grain in fuel production. Drinking water leaking from water pipes and fish not landed, although they have been caught, are two other examples.

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which, in the absence of any possible alternative use, is marked for destruction". French and Italian Food Waste Legislation. An Example for other EU Member States to Follow? *European Food and Feed Law Review*.

[58] European Commission, *Guidance on reporting of data on food waste and food waste prevention according to Commission Implementing Decision* (EU) 2019/2000, p. 7.

[59] Naturvårdsverket, *Livsmedelsavfall i Sverige 2024*, p. 5.

[60] GFL art. 3 sec. 2 and Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption [2020] (OJ L435/1), art. 6.

[61] SFL sec. 3.

However, there is criticism of how the EU handles the issue of food waste within the general waste legislation. Bradshaw argues that the legal definition of waste does not take into account the special value food has, relative to much else that can become waste.[62] She also argues that EU waste hierarchy becomes the waste *management* hierarchy and not waste *prevention* hierarchy, at least when it comes to food waste.[63] Bradshaw therefore claims that the current legal definition of waste in reality leads to increased food waste because waste may not be released onto the market as it is by definition not considered safe, regardless of whether this happened for formal reasons (for example, that the last date of consumption has passed) or because it is objectively unsafe in terms of microbiological criteria. Food may be edible but still considered waste. Bradshaw therefore argues that waste law is actually a part of the food waste problem, because there is an over-inclusive definition of (food)waste.[64] We agree with this criticism.

Garske et al. are also critical, and consider, among other things, that regarding the importance of being able to reduce food waste, it is regrettable that there is no legal connection between food waste and the waste hierarchy.[65] They also state that a legal anchoring of the waste hierarchy taking into account the special character of food products and thus including in particular food donations would be welcome.

[62] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, p. 6.
[63] Ibid., p. 13.
[64] Ibid., p. 11.
[65] Beatrice Garske et al., Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land*, *Volume 9, Issue 7 (July 2020)*, p. 9.

2.4 Food supply chain

Other problematic concepts are "food chain", "food supply chain" (already mentioned) and the applicability of food legislation. According to the Swedish Food Agency (SFA),[66] the food supply chain extends from farm to table, from growing fruit and vegetables, raising animals, hunting, and fishing, to slaughterhouses, production of drinking water, and industrial production of food and feed, as well as cooking, serving, and selling food. Storage and transport of food are also covered.[67]

However, the food legislation is only applicable to a part of this chain, namely from harvest/slaughter until food reaches the final consumer, and thus is not applicable to primary production prior to harvest/slaughter or to preparation, handling, or storage of food for private domestic consumption after the point of sale (retail cashier or home-delivered).[68]

By "the food chain" we mean in this article the relatively limited area within which the food legislation is applicable. Regarding how food and food waste are defined in EU legislation, even food that is disposed of in private homes is included in the noun food waste, despite the food legislation not being applicable there. This is because the legal concept of food is not linked

[66] Livsmedelsverket.
[67] Livsmedelsverket, https://www.livsmedelsverket.se/foretagande-regler-kontroll/sa-kontrolleras-ditt-foretag/nkp-webben/saharutfarskontrollen/livsmedelskedjan. Our translation here.
[68] GFL art. 1.3. The control agencies are tasked with controlling primary production even before slaughter and harvest, but since large parts of the food legislation covers both food and feed, it can sometimes be difficult to distinguish between food control and feed control. Where the line should be drawn is possibly debatable, but our understanding is that before harvest and slaughter, the main purpose of the inspection is to check what the animals and crops can ingest. Of course, with the primary purpose of ensuring that the food that later on will be sold is not contaminated due to feed content, pesticides or contaminated irrigation.

to the food supply chain, but to products that are intended to be, or can reasonably be expected to be, consumed by humans as food (after harvesting and bleeding), i.e., the food chain. Since the purpose of food legislation is to protect operators at the consumer stage, the focus of the food law is on the handling stages before consumers receive the food.

2.5 The Environmental Code and the food supply chain

The applicability of the SEC is not limited by the concept of food, by the food supply chain, or by food legislation, as it targets responsible use of raw materials and energy, irrespective of sector of society. It is therefore not a problem that the food legislation does not include handling of food in private households or crop losses in the field, since measures to prevent food loss and waste can be based on the environmental legislation, which applies to all operators along any supply chain, i.e., from farmers to consumers in the case of food.

To avoid borderline problems regarding the definition of the terms food and waste, we have instead chosen to discuss resource management along the food supply chain. Another expression is waste prevention (instead of waste management).

Having this delimitation of the analysis also made it easier to have further discussions about how resource management can be carried out. Although in most cases it (probably) means adopting the most resource saving option, using as much as possible as food. In certain situations it can be better to use a certain resource as animal feed or as fertilizer if the alternative, to use it as food, requires extensive inputs in terms of, for example, packaging, refrigeration, and transport.

The more a raw material has been refined, the greater the losses will be if it is not ultimately used as food. Expressed in thermodynamic terms, entropy decreases the more processing a product has undergone, which at the same time increases exergy losses if the product is thrown away or used for any purpose other than food.

3. EU food legislation and waste of food

Food law is defined as "*the laws, regulations and administrative provisions governing food in general, and food safety whether at Community or national level; it covers any stage of production, processing, and distribution of food, and also of feed produced for, or feed to, food producing animals.*"[69] This is called the food supply chain.

EU Regulation 178/2002 is often referred to as the General Food Law (GFL). The EU food legislation has three overriding aims; namely safe food, free movement of food products within the EU, and enabling consumers to make well-informed choices.[70] Reducing food waste is not an aim of EU food legislation and there are no specific statutes about this within the area of food legislation.[71] The opposite applies to EU environmental legislation, where explicit binding aims to reduce food waste are being introduced.[72]

In 2021, the EU launched the voluntary "*EU Code of conduct on responsible food business and marketing practices. A common aspirational path towards sustainable food systems*". One of the Code of Conduct's objectives is to prevent and reduce food loss and waste (at consumer level, within

[69] Bernd van der Meulen et al., *EU Food Law*, p. 114.
[70] GFL art. 5.
[71] The EU legislation on ecological food can be considered an exception to some extent, but that regulation does not cover all food handling as it is a voluntary commitment to produce or handle such food.
[72] Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste COM/2023/420 annex to the Directive of the European Parliament and of the Council amending Directive.

internal operations, and across value chains).[73] The target is 50% reduction in per capita food waste at retail and consumer levels by 2030 and reduced food losses along the food production and supply chains in the EU. This does not constitute a legally binding requirement but a voluntary agreement and there is therefore also no binding way to enforce it.

The EU Commission is now proposing,[74] through an amendment to the WFD, that MS must take the necessary and appropriate measures to achieve, by 31 December 2030, the following food waste reduction targets at national level:[75]

- reduce the generation of food waste in processing and manufacturing by 10% in comparison with the amount generated in 2020.
- reduce the generation of food waste per capita, jointly in retail and other distribution of food, in restaurants and food services, and in households, by 30% in comparison with the amount generated in 2020.

As mentioned above, one link between food and environmental law is the legislation on waste, which is a part of the environmental legislation. Waste is also an issue for food legislation, not because of interest in saving resources, but for food safety reasons.[76] Inadequate handling of waste can spread infections, etc.[77]

There are some rules in food legislation that have the purpose of guaranteeing food safety, but which at the same time may promote wasting of food.[78] Such rules may be counterproductive from a food waste perspective,[79] but necessary for food security reasons. See, for example, the rules on food date marking: "*best before*" and "*use by*"[80]. After the 'use by' date, a food is deemed to be unsafe,[81] even if in the specific case there is nothing wrong with the food. The basic provision in GFL art. 14, that food must be considered unsafe if it is unfit for human consumption, may also be problematic in this regard. For example, it is unclear whether a fruit should be considered unfit for human consumption when it is only slightly damaged or rotten, or whether a net of ten oranges should be considered unsafe if one orange is moldy.

In some cases, there is therefore a conflict of objectives between the food legislation and the environmental (waste) legislation. In the individual case, however, both legal requirements must be met for the operation to be legal.[82]

Even if the food is still healthy, for example date markings partly mean that the food can-

[73] Aspirational objective 2, p. 14.
[74] Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste. COM(2023) 420 final.
[75] See for example Laura Gómez-Urquijo. The implementation of EU Legal Framework to Reduce Food Waste: The Case of Spain. *European Energy and Environmental Law Review*.
[76] Bernd van der Meulen et al., *EU Food Law*, p. 183.
[77] See regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs, (2004) [OJ L139/1]. Annex ll, Ch. Vl on waste. Also included in GFL art. 14.
[78] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, p. 5.
[79] Helena Martinsson, *Matsvinn I butik – Hur påverkar livsmedelslagstiftningen?*
[80] Regulation (EU) No 1169/2011 of the European parliament and of the Council of 25 October 2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004 EU regulation 1169/2011, (2011) [OJ L304/18], art. 24. Also, Carrie Julia Bradshaw Waste Law and the Value of Food. *Journal of Environmental Law 2018*, p. 6.
[81] GFL art. 14(2) to (5).
[82] SEC ch. 1, sec. 3 that states that the Code applies in parallel with other laws (with the exception of the Work Environment Act).

not be sold despite its quality, and there are also many consumers who "just to be safe" do not eat food if the date has passed without having checked the quality themselves. Food waste is thus increasing both among food business operators and end consumers.

Food legislation is based on the principle of the reverse burden of proof to the extent that it is always the food business operator who must demonstrate that all legal requirements are met,[83] and in practice there must be a documented self-control program for each facility.

4. The Environmental Code

4.1 Aims

In this section, we describe the basic rules in the SEC, and we also point out the similarities that are often found with the provisions of the food legislation. The aim of the SEC is to achieve sustainable development,[84] in which management of raw materials, natural resources, and energy is a key component, alongside environmental and health protection and conservation of biological diversity. Food safety does not fit within the concept: *detriment to human health*, used in the SEC.[85] With the exception of that the quality of drinking water from small drinking water installations for private use is covered by the health protection regulations of the SEC.[86]

Within life cycle assessment methodology, three "areas of protection" constitute the endpoints against which indicators are evaluated when performing a full life cycle impact assessment. These are: "Human health", "Natural environment", and "Natural resources".[87]

All provisions of the SEC must be applied in such a way that the goals and purpose are best met.[88] When there is doubt about what should be decided or done, the alternative that is most likely to benefit sustainable development should be chosen. This, together with the fact that the legislator chose to enumerate, for example, health protection, protection against pollution of various kinds, preservation of biological diversity, and management of natural resources as separate sub-objectives, must, according to our understanding, mean that these are also independent of each other. Thus it should not be required for a resource withdrawal to also cause pollution for it to be covered by the legislation. In our opinion, the need to save resources is reason enough in itself. We believe this has not been emphasized before in the Swedish environmental law discussion. The legislator has stated (ch. 1, sec. 1 and ch. 2, sec. 5 of the SEC) that resource management is important and that one way to achieve it is to create circular material flows, which should not be seen as an end, but as a means.

In the same way as in life cycle assessment methodology, all these sub-goals in the SEC have their own intrinsic value and stand on their own, without being dependent on any other objective to be enforced.[89]

The SEC objectives (SEO) provide guidance in application of the SEC regarding assessment of what sustainable development entails.[90] There

[83] GFL art. 17.
[84] SEC ch. 1, sec. 1.
[85] SEC ch. 9, sec. 3: 'Detriment to human health' shall mean any disturbance that is liable to have adverse effects on health in medical or hygienic terms which are not minor or temporary.
[86] SEC ch. 9, sec. 10. Also, Helfrid Schulte-Herbrűggen et al., *Dricksvatten från små dricksvattenanläggningar för provat bruk. En faktaskrift med information kring ansvar, lagstiftning, vattentäkter, kvalitet och åtgärder*.
[87] ILCD, *International Reference Life Cycle Data System (ILCD) Handbook: Framework and Requirements for Life Cycle Impact Assessment Models and Indicators*.
[88] *Government bill 1997:98/45 part 2*, p. 646. Our translation.
[89] ILCD, *International Reference Life Cycle Data System (ILCD) Handbook: Framework and Requirements for Life Cycle Impact Assessment Models and Indicators*.
[90] *Government bill 1997:98/45 part 2*, p. 646.

is no specific goal on food waste (or on resource management in general), but since 2021 there is a milestone target for food waste within the SEO sphere, and responsible resource management is a prerequisite for some of the existing goals, such as limited climate impact,[91] and for the overarching Generational Goal mentioned above.

Although the SEOs are intended to facilitate interpretation of the SEC, they have no legal relevance in terms of how the *food* legislation is to be interpreted. To enforce the SEOs and the Generational Goal, it is therefore necessary for the requirements to be set through the environmental legislation.

In the SEC there are no references to food legislation, and the SEC therefore also has no limitations in relation to the food supply chain. We can therefore state that the SEC is applicable to the whole food supply chain, but not limited to it. Whether an alleged waste of resources occurs within or outside the food supply chain, or outside the scope of application of the food legislation, is therefore irrelevant to the applicability of the SEC. The SEC regulates the utilization of natural resources (and energy), regardless of which natural resource it is.

4.2 Primarily not a product legislation

From the food law perspective, shops, restaurants, manufacturers, and others who handle food along the food supply chain are named "*food business operators*"[92]. From the environmental law perspective, operators in the food supply chain, like everyone else, are instead named "*operators*" [*verksamhetsutövare*], which includes "anyone taking an action or measure".[93] The terms 'activity' [*verksamhet*] and 'measure'[*åtgärd*] are not defined by law but have been interpreted through case law and in preparatory works.

An *activity* may, for example, be a factory, a treatment plant, or any other human activity that is not solely instantaneous, and which may cause harm or risk for human health or to the environment as such, including the interest of saving natural resources. The SEC is applicable to all human *activities* and *measures* that may affect the possibilities to achieve its objective.[94] The SEC is therefore not applicable to food itself, but to the activities where food is prepared, processed, transported, and sold, i.e., what is usually called the *food supply chain*.[95]

The SEC is therefore not primarily a product legislation in the same way as the food legislation[96], but rather a legislation that regulates various human activities within which food can be handled in different ways.

The person responsible is the (physical or legal) person who runs the activities or conducts the measure. In many cases, both food and environmental legislation are applicable to the same activities, which means that the person responsible is simultaneously a *food business operator* and an (*environmental law) operator*. Like the food legislation, the SEC is also applicable to professional activities and the public sector. However, contrary to the food legislation, it also applies to what private persons do for private use in their homes. In the SEC, this is expressed as" *The person who pursue an activity shall…*".[97]

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[91] Livsmedelsverket, Naturvårdsverket och Jordbruksverket. *Fler gör mer. Handlingsplan för halverat matsvinn 2030*, p. 10.

[92] Defined in GFL art. 3(6).

[93] See for example SEC ch. 2, sec. 3.

[94] SEC ch. 2, sec. 1 and 2, for example. *Government bill 1997/98:45-part 1*, p. 1.

[95] With the exception of drinking water from small individual water sources, mentioned above.

[96] SEC's rules on chemicals and on waste may constitute exceptions to this.

[97] SEC ch. 2, sec. 1 and 2 for example. Compared with GFL art. 1.3: "It shall not apply to primary production for private domestic use or to the domestic preparation, handling or storage of food for private domestic consumption."

However, there is an exception stating that ch. 2 of the SEC is not applicable to measures *that are of negligible significance in individual cases*.[98] This exception refers only to *measures*, taking into account the possibilities of achieving the objectives of the SEC, which in the individual case have no or only marginal importance for human health, or to protection of the environment. It primarily refers to measures taken by individuals where a correct environmental impact analysis probably cannot be done.[99] This exception provision is thus primarily not intended to be applied to anything other than what may happen to private individuals. This does not mean that the Code cannot generally be applied to what private persons do, only that those measures with very little environmental impact are exempted from the call for applications.

Within the food supply chain, there are many different types of activities to which the Code is applicable. In some cases, it is obvious that these activities are both a food business operator and at the same time an activity, which means that both legislations are applicable to them, but with different perspectives.[100] Examples of these "double" activities roles are slaughterhouses, food processing industries, and smokehouses. These establishments are driven by food business operators but are also activities under the SEC, historically mostly because emissions from such activities may harm the surrounding local environment.

In other cases, such as retailers,[101] it is not so obvious that the SEC is applicable. However, in view of the aims of the SEC to protect human health, to minimize harm to the environment, *and to save raw materials and energy*, the situation becomes clearer. An activity does not have to be both risky for the environment, for human health, and for mismanaging resources. For the SEC to be applicable, it is enough if any one of these aspects is affected.

It has long been accepted that management of waste within food businesses can be a matter for the food safety legislation and at the same time a matter for the SEC. When it comes to the application of the SEC on (food) waste, it is both a sanitary issue and an issue on waste. From the food law perspective, management of waste is primarily about avoiding hygiene risks.

4.3 Substantive norms in the Environmental Code

4.3.1 Introduction

The purpose of substantive norms is to express the requirements placed on the addressee of the rule, i.e., to state what he/she may or may not do. The requirements in the SEC can be roughly divided into two categories, namely *the general rules of consideration* (ch. 2), which apply to all kinds of activities and measures, and more *specific rules* concerning specific kinds of activities or subjects formulated in separate chapters within the SEC, in ordinances or in by-laws. The rules on by-products and end-of-waste in ch. 15 are examples of the latter. The general rules of consideration are written in such general terms that they neither specify nor exclude any types of activities.

Every person (physical or legal) who pursues an activity or takes a measure is responsible for complying with the requirements of the SEC, regardless of whether there are requirements from a supervisory agency or not. The responsibility for carrying out self-control rests with the operator,[102] who has the power and ability to control the activity or measure.[103]

[98] SEC ch, 2 sec. 1, paragraph 2.
[99] *Government bill 1997/98:45-part 2*, p. 13.
[100] Ibid., 1, p. 190.
[101] Defined in GFL art. 3.7.
[102] SEC ch. 26, sec. 19.
[103] Gabriel Michanek et al., *Den svenska miljörätten*, p. 296.

In some cases, a permit is required to start an activity, while in other cases a notification is required.[104] In most cases concerning food business operators, neither is required. If the SEC is applicable, operators must on their own meet all relevant requirements. There are never requirements for a permit or notification (under the SEC) for food retailers,[105] but this is often the case for food industries of various kinds.

In this article, we focus on the general rules of consideration in ch. 2 and elaborate on how to apply these to different kinds of food business operators. The focus is on how these rules can be used to reduce food waste.

4.3.2 General rules of consideration

General

The general rules of consideration (ch. 2) are applicable to all activities to which the SEC is applicable. The most relevant provisions of this chapter are briefly commented on below. Within the food supply chain, this part of the SEC is applicable to retailers such as restaurants, pubs, food industries, and even, for example, mobile market stalls and food transport. The general rules of consideration are also applicable to establishments outside the food chain, such as farmers, food waste management, and in private homes (with the exception above). This means that the entire food *supply* chain is covered by the SEC. However, handling of food in private households for private individual use is clearly excluded from the scope of the food legislation.[106]

The requirements set based on sec. 2–5 and sec. 6, should not be unreasonable to comply with: *All measures shall be applicable where compliance cannot be deemed unreasonable* (expensive for the operator). An economic reasonableness assessment must therefore be made in each individual case.[107]

Reverse burden of proof and knowledge

The SEC is based on two basic principles, namely the reverse burden of proof and the knowledge requirement. It is the operator who conducts or intends to start an activity,[108] etc. who must show that this can be done without risk of inconvenience to human health or the environment, or about the management of natural resources, and be able to show that they comply with the SEC in general. This reverse burden of proof applies continuously and as long as the business continues. All activities must be able to demonstrate to the supervisory agency that they fulfill requirements on, for example, managing resources and how this is done. This also applies within food legislation, even if the term reverse burden of proof is not used.[109]

The operator must have knowledge of what the activity entails, or will entail, for human health,[110] for the environment, and for the possibilities of managing natural resources. Basically, this is about having the necessary knowledge about the activity, which is also a basic requirement in food regulation.[111] A food business operator must have knowledge of, for example, the environmental impacts caused by it, which we claim can also include knowledge of how much food is wasted and how this may be reduced.

[104] How this division looks can be seen from the Environmental Assessment Regulation (SFS 2013:251). (Miljöbedömningsförordningen.)
[105] The term *retail* is defined in GFL art. 3.7 and covers transports, shops, restaurants as well as school canteens and hospital kitchens etc.
[106] GFL art. 1.3.
[107] SEC ch. 2, sec. 7.
[108] SEC ch. 2, sec. 1.
[109] EU regulation 852/2004 art. 3.
[110] SEC ch. 2, sec. 2.
[111] See EU regulation 852/2004 art. 5 on hazard analysis and critical control points.

Precautionary measures and best possible technology

All operators must implement protective measures, comply with restrictions, and take any other precautions that are necessary to prevent, hinder, or combat damage or detriment to human health or the environment because of the activity or measure.[112] Various types of precautions and restrictions will be formulated as conditions in permits or orders but must also be followed voluntarily in situations where there is no permit review.

References in the SEC to the formulation "*damage or detriment to human health or the environment*" thus mean that the aim of the SEC[113] must be considered in the parts that are relevant in the context,[114] which includes resource management.

The SEC is technology-neutral, which means that it is the result which matters, not how it is achieved, a principle also found in the food legislation.[115] Thus the kinds of measures that can be taken to fulfill the aims are only limited by the imagination and, when it comes to a new area like waste of food, it is not clear which measures may be most appropriate. The choice of measure depends on many factors, such as where in the food supply chain the measures need to be put in place, the type of foodstuff, if there is a use for the lost food or not, etc.

In the case of professional activities, the best possible technology (BPT) must be applied.[116] "Technology" shall be interpreted broadly: "*By 'technology' is meant not only production devices but also methods of production such as training and management. The integrated approach to technology and organization that is beginning to be applied within the EU should also be expressed in the Environmental Code. The shift in environmental work from purification technology to recycling thinking means that a company's whole organization is affected by environmental requirements.*"[117]

This means that when deciding what is best possible technology, the assessment should include the result for the environment in general. Raw material use and energy consumption should also be considered, so technology that leads to less raw material consumption or to the use of recycled products or that is more energy-efficient may be better for the environment than technology that makes it possible to reduce emissions slightly.[118]

Best possible technology, anywhere on earth, should be the starting point, but the technology must be possible to use in the specific kind of operation.[119] Due to preparatory works, in Sweden best possible technology means that the technology must be economically and technically possible for that kind of operation in Sweden.[120] It is also not the individual company's finances that should be decisive, but the average financial situation in the type of operation (in Sweden) in question.[121] See further below.

To summarize, it must be practically possible to use that kind of technology and it must have been used in practice, i.e., not only as a pilot project.[122] The technology must be economically

[112] SEC ch. 2, sec. 3.
[113] Ibid., ch. 1, sec. 2.
[114] *Government bill 1997:98/45 part 2, p. 645*. Our translation.
[115] In principle, food may be placed on the market if it is not unsafe. What measures needs to be taken to ensure that a food is safe is usually not prescribed.
[116] SEC ch. 2, sec. 3. Eriksson et al. shows how this can be applied to the food chain. Making food waste illegal in Sweden – potential gains from enforcing best practice in the public caterer sector. *Sustainable Production and Consumption 35 (2023)*, pp. 229–237.
[117] *Government bill 1997/98:45-part 1 p. 216*. Our translation.
[118] Ibid.
[119] Gabriel Michanek et al., *Den svenska miljörätten*, p. 123.
[120] *Government bill 1997/98:45-part 1*, p. 215.
[121] *Government bill 1997/98:45-part 2*, p. 23 2 and Gabriel Michanek et al., *Den svenska miljörätten*, p. 123.
[122] Ibid.

feasible to use "typically in the industry".[123] This is a competition-neutral approach which for a company with a relatively weak economy can be a decisive obstacle to realization of the plans (in practice due to the costs), while a successful company does not suffer from extra high demands, even if it has economic scope.[124]

An important limitation in the SEC is that it is not possible to question the purpose of an activity or measure.[125] It is therefore not possible to demand that a slaughterhouse should convert to handling vegetables instead, even though that would be better for the climate.[126] However, if the purpose can be achieved by using less resource-intensive processes, raw materials, or ways of working, that may be demanded.

Measures for managing resources and waste minimizing

In 1983, a government official report described the need to reduce resource utilization.[127] However, no legislation in this area was implemented until the SEC in 1999, and then as a response to the conclusions in the Brundtland report.[128]

Chapter. 2, sec. 5 of the SEC is a clarification of what is expressed through the last paragraph in the portal section of the Code, and it expresses the principles of resource management ("to save raw materials") and of eco-cycles.[129]

> *"Any who pursue an activity or take a measure shall conserve raw materials and energy and take advantage of the opportunities to*
> 1. *reduce the amount of waste;*
> 2. *reduce the amount of harmful substances in materials and products;*
> 3. *reduce the negative effects of waste; and*
> 4. *recycle waste.*
>
> *Preference shall be given to renewable energy sources."*[130]

The focus of the provision is not only to reduce the amount of waste, but also to reduce resource utilization in general. An important tool for this is creating ecocycles. This is now part of the Swedish implementation of art. 9.1(a) in the WFD, which requires MS to take measures to prevent waste generation.[131] The further regulation concerning waste management is then found in ch. 15 of the SEC and in Government ordinances.[132]

While the provision in the SEC is not related to a certain level of reduction (concerning resource utilization or waste generation), it has the potential to be an important tool in achieving the EU's proposed goal of reduced food waste by 2030. The Government underlines that the interest in saving all kinds of resources (and energy) is so important that the resource-saving aspect must be part of the general rules of consideration.[133] The term 'raw materials' as used in the SEC includes not only raw materials as

[123] Ibid.
[124] Gabriel Michanek et al., *Den svenska miljörätten*, p. 123 and *Government bill 1997/98:45-part 2*, p. 15.
[125] Gabriel Michanek et al., *Den svenska miljörätten*, p. 120.
[126] Ibid. Compare also wordings in SEC ch. 2, sec. 4 and 6, that the purpose of the activities must be achievable. *Government bill 1997/98:45 part 1*, p. 210 and 223 and *part 2*, p. 22.
[127] *SOU 1983:56 Naturresursers nyttjande och hävd*. See also *Government bill 1992/93*.
[128] The World Commission on Environment and Development, *Our Common Future*.
[129] SEC shall be applied in such a way as to ensure that:/…/ 5. reuse and recycling, as well as other management of materials, raw materials and energy are encouraged with a view to establishing and maintaining natural cycles.
[130] Our translation here.
[131] WFD. See also preamble 29 in the directive 2018/851 (amending the WFD). "Waste prevention is the most efficient way to improve resource efficiency and to reduce the environmental impact of waste. It is important therefore that MS take appropriate measures to prevent waste generation and monitor and assess progress in the implementation of such measures."
[132] Waste ordinance (SFS 2020:614).
[133] *Government bill 1997/98:45-part 1*, p. 220.

it is usually understood, but also products and other forms of resources.[134] There is therefore no reason to assume that leftover food, ingredients, or raw materials for food are not covered, in the same way that crop residues left behind in the field can also be covered, as well as food handling in private homes.

Applying the resource management principle means, for example, that a resource- and energy-efficient process is used in the manufacturing of goods. The intention is for application of these principles to steer development towards a more resource-efficient society regarding raw materials and materials and environmentally friendly product production.[135]

The Government emphasizes that "*An ecologically sustainable society requires increased resource efficiency. Efficiency and recycling thinking thus go hand in hand*."[136]

The resource management principle states *"that all activities must be conducted, and all measures must be taken in such a way that raw materials and energy are used as efficiently as possible, and consumption is minimized*.[137]

The eco-cycle principle means that what is extracted from nature must be sustainable, recyclable, and disposable with the least possible consumption of resources and without compromising nature injured. It can also be expressed as a principle that aims at closed material flows.[138]

As the Government points out, the need to consume finite natural resources will decrease if the resource management principle and the cycle principle are applied. Such an Ecocycle can be achieved partly by requirements – individual or general – for the conduct of business, and partly by everyone participating in waste management by, for example, source sorting, which enables reuse, recycling, and energy use.[139] Preference should be given to such use as entails good resource managing from a public point of view.[140] This requirement applies in full, in addition to requirements otherwise set in ch. 2, and has the same strength.[141]

It is worth noting that this provision is aimed at everyone, private individuals, companies, and public institutions, who pursue an activity or take a measure, with the exception mentioned above that the chapter is not applicable to measures (but is to activities) that are of negligible significance in individual cases. This means that in many cases it is difficult to apply it to food handling in private households for private use, where the use of resources, or waste of food, is mostly relatively limited. However, the possibility that such situations exist is not excluded.

Although the requirement for best possible technology can be considered to also include the resource-saving requirements. The basis for this is that even with the support of ch. 2 sec. 3, it is possible to impose requirements on resource management.

The legislator probably did not have the food supply chain in mind when the statute was written, but our analysis shows that this legislation may be applied to food business operators (and private persons) in the food supply chain. When the SEC was introduced, the large impact of the food system was not clear. Today, we know that energy transition and food systems transition are the two main transformations that must take place for countries to have any possibility of complying with the Paris Agreement.[142]

[134] Ibid., p. 217 and *part 2*, p. 659.
[135] Ibid., p. 658.
[136] Ibid., p. 217.
[137] Ibid., p. 658.
[138] Ibid., p. 658 (digital version). *Government bill 1992/93:180*, p. 14.
[139] *Government bill 1997/98:45 part 1*, p. 168.
[140] Ibid., p. 168.
[141] That is care for biological diversity, pollution prevention, sanitary aspects, etc.
[142] Johan Rockström, *Stockholm Resilience Centre*.

As mentioned above, all food companies within the food supply chain are activities within the meaning of the SEC. Temporary food handling is also covered by the legislation. The SEC is applicable regardless of who the operator is. We also established above that the concept of raw materials includes everything from unprocessed newly extracted materials to finished products, and there is no exception for foodstuffs. We therefore consider that all the necessary prerequisites ch. 2, sec. 5 of the SEC to apply to food businesses in the food supply chain are fulfilled.

Assessment of reasonableness

The general rules of consideration are applicable where compliance cannot be deemed unreasonable. Importance must be attached in this regard to the benefits of protective measures and other precautions in relation to their cost.[143] Businesses may need to take such measures, etc. to reduce the environmental impact in the broadest sense, to protect health, or to reduce resource utilization.

When it comes to economic reasonableness, it is the average economy of facilities of similar size and age in Sweden that should be the object of comparison. This means that it does not matter if a specific facility is particularly successful or if it has poor finances.[144] The assessment must comprise the following steps:[145]

First, the cost of the requirements included in the concept of best possible technology must be assessed. This has been commented on above. Second, whether this requirement is unreasonable in view of the circumstances of the individual case must be assessed. The requirement must be environmentally justified and economically reasonable. Only in this last step, this is a question of a balance of interests in the true sense.[146] The most important question is whether the cost corresponds to the benefits, where one must consider the degree and nature of the impact in question, not only the nature of the disturbances, but also the sensitivity of the people and the environment affected. The requirement set after the final assessment is sometimes called "best available technology", which corresponds to BAT in the EU Industrial Emissions Directive.[147]

4.4 Enforcement norms in the Environmental Code

4.4.1 Self and official supervision/control

Effective supervision is probably the most feasible way to enforce the SEC. The starting point for supervision according to the SEC,[148] and for control according to food law,[149] is that each business operator must carry out self-control and oversee their business so that the requirements of the legislation are always followed. Nor does this make any difference to the requirements in the food legislation.[150]

The business operator must continuously plan and manage the business to prevent unauthorized actions or consequences, keep informed about the impact of the business or measures and, upon request, submit proposals for control programs or improvement measures to the supervisory agency.[151] One kind of improvement could be to develop measures to reduce resource wastage, both of production materials and of finished products.

[143] SEC ch. 2, sec. 7, paragraph 1.
[144] E.g. MÖD M 9888-12, p. 25, the Land and Environmental Court of Appeal and comments on that by Gabriel Michanek et al., *Den svenska miljörätten*, p. 140.
[145] Gabriel Michanek et al., *Den svenska miljörätten*, p. 139.
[146] Ibid.
[147] Directive 2010/75/EU. Further Gabriel Michanek et al., *Den svenska miljörätten*, p. 140, footnote 141.
[148] SEC ch. 26, sec. 19.
[149] GFL art. 17.1.
[150] Se for example EU regulation 852/2002 art. 5 on hazard analysis and critical control points.
[151] SEC ch. 26, sec. 19.

In addition to self-control, there are also systems for agency supervision/control. Within both environmental and health protection and food handling, there are national, regional, and local agencies with this responsibility. Both at local and regional level in Sweden, it is the same agency that conducts food control and supervision on the accordance with the SEC.

4.4.2 Injunctions and permit conditions

When an agency wants to influence an individual's behavior, this must be done through formal decisions as injunctions.[152] We believe this is likely to be the most important legal instrument for enforcing compliance with the SEC's resource management provision. In the SEC, there are essentially three different forms of injunction:

a) Injunction on action,[153] either formulated in terms of what is to be done/not done or what to be achieved.
b) Injunction on carrying out own investigations, such as measurements and calculations.[154]
c) Injunction to release certain materials, such as analysis reports, self-control programs, and existing investigations.[155]

Whoever conducts such activities must submit proposals for control programs or improvement measures to the supervisory agency, if the supervisory agency requests it.[156] Injunctions may be combined with penalty of a fine.[157] In accordance with the principle of proportionality, an agency may not resort to a legal remedy that is more intrusive than necessary.[158] Injunctions may in some cases be enforced with the help of the Enforcement Agency,[159] an option that is very rarely used. For businesses that require a permit for start-up, such as slaughterhouses and other large-scale producers of food,[160] conditions regarding resource management can be written into the permit: "*the conditions needed with regard to the management of land, water and other natural resources*".[161]

Although it is illegal to violate the general rules of consideration, it is not criminalized. It is not a criminal offense to breach an injunction either, regardless of whether it is based on food or environmental legislation. For something to be punishable according to the SEC, there must be special a penal provision for this, which is not the case for mismanagement of natural resources.[162] An exception is if, for an activity that requires an environmental permit for operation, there is an expressed condition regarding management of natural resources. In that case, not complying with the condition is a criminal offence.[163]

5. Applying the Environmental Code to the food supply chain

5.1 Food business operators and the Environmental Code

Food business operators are not excluded from the scope of the SEC simply because food legislation is applicable. Double regulations of this kind are common, and it is the rule rather than the exception for an activity to fall within several different areas of legislations at the same time. All food business operators must hence meet the requirements of both regulatory systems.

[152] Supreme Administrative Court, RÅ 2004 ref. 8.
[153] SEC ch. 26, sec. 9, para. 1.
[154] SEC ch. 26, sec. 22.
[155] SEC ch. 26, sec. 21.
[156] SEC ch. 26, sec. 19.
[157] SEC ch. 26, sec. 14.
[158] SEC ch. 26, sec. 9, para. 3.
[159] SEC ch. 26, sec. 17, which includes injunctions with the support of ch. 26, sec. 21 or 22.
[160] Activities that require a permit or a notification can be found in the Environmental Assessment Ordinance (SFS 2013:251), ch. 5.
[161] SEC ch. 22, sec. 25, para. 10.
[162] SEC ch. 29.
[163] SEC ch. 29, sec. 4.

The expression term "*For the protection of human health and the environment*", which is often used in the SEC,[164] includes everything that the SEC intends to protect, such as biodiversity, disturbances due to pollution, human health, and use of natural resources. However, as in food legislation,[165] according to the SEC each operator is only responsible for the environmental and health effects generated by their operations, not what happens upstream or downstream in the food supply chain. Operations in the food supply chain can generate such effects, so it is very difficult for a regulatory agency to find legally relevant reasons to require a grocery store to reduce the impact on biodiversity, or to reduce emissions to lakes and waterways upstream in the food chain. Another problem that must be dealt with when trying to steer towards reduced food waste is that an action at one point in the food supply chain does not always generate an effect at the same place, which is often referred to as chain effects or cascade effects in the food chain.[166]

Chain effects means that the cause of food waste is found in a completely different step along the product flow than where the loss becomes visible and can be measured.[167] This means that it can often be more difficult to see through the chain of events/causes that lead to food waste.[168] *Cascade effects* are characterized by the fact that the cause is found in a step of the product flow but gives rise to cascades, thus generating food waste in several steps along the product flow.[169] For a food-producing industry, water discharge can be a key issue. Official demands to reduce food waste in stores will at best cause chain reactions in the form of smaller quantities of food being produced (upstream) and less climate-affecting gases being generated (downstream).

5.2 Conflict of goals

Garske et. al argue that despite repeated political statements and initiatives, there is currently no coherent and ambitious approach to tackle food waste along the entire food supply chain in the EU.[170] The food legislation has different objectives than the SEC. Among the three objectives of food legislation (see ch. 3 above), it is probably the objective of "safe food" that can entail special conditions regarding the possibilities of governing with the SEC. The aim of the SEC is sustainable development, which includes a high degree of resource management, and this could come into conflict with the food legislation's objective of safe food. Food safety is not included in the SEC's concept of health protection, except for certain small-scale water plants.

Safe food means that products which do not meet sufficient food safety requirements may not be placed on the market,[171] but must be thrown away or used for something else. In some cases, they can be used as raw material for a dish, but the more a product has been refined, the greater the loss of resources if it must be thrown away. Such a procedure could be considered unsustainable according to the SEC but is necessary according to food legislation. There could thus be a conflict between the SEC's aspiration to reduce the amount of waste (ch. 2, sec. 5) and

[164] I.e., SEC ch. 2, sec. 3.
[165] GFL art. 17.1.
[166] Ingela Lindbom et al., *Åtgärder för att minska svinn i livsmedelsindustrin. Ett industri- och kedjeperspektiv*. Naturvårdsverkets rapport 6959, december 2013.
[167] Ibid., p. 23.
[168] Ibid., p. 23.
[169] Ibid., p. 24.
[170] Beatrice Garske et al., Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land. Volume 9, Issue 7 (July 2020)*, p. 14.
[171] GFL art. 14.

the food legislation's requirements for safe food (GFL art. 14).

The requirement that food must be safe can constitute an obstacle (e.g., to its reuse, storage for longer periods, or handling in different places with different climate conditions). In this way, food legislation can be counterproductive in relation to the need to reduce food waste. Food that does not meet relevant hygiene requirements may not be donated to charitable purposes at all.[172] It is not a good idea to demand resource-saving measures with the support of the SEC, while at the same time endangering food safety.

In other words, while the SEC strives for as many resources as possible to be used for as long as possible, food legislation strives to prevent, for example, reuse of food, for safety reasons. It can be expressed as that "food law in some cases pushing" for more waste while the environmental law pushes for less waste. As Bradshaw puts it:[173] "*Whilst food law is largely unconcerned with managing food as a resource, it does shape the line between edible and inedible food in ways that are conceptually appropriate (albeit imperfectly drawn) in view of food's importance and difference as a resource.*"

Garske et al. list a number of food safety rules in the EU's food legislation which in one way or another can seem counterproductive in relation to the fact that food waste must be reduced at the same time according to the WFD, and mentions e.g;[174]

- Recalls and withdrawals for food safety reasons.
- Rules on food packaging.
- Different kinds of date labelling frequently contribute to confusion about the safety of food products. Consequently, safe and edible food is thrown away.
- Specific marketing standards for fruit and vegetables which are required for aesthetic rather than food safety purposes.
- (The fact that dumpster diving is illegal in some MS.)[175]

This is a tricky balancing act, both on an individual level and for agencies and legislators, that in many cases leads to increased waste of food. In some cases, it may be because the individual end consumer chooses to throw away a food product rather than risk it being unhealthy to consume (even though the product is still safe), not infrequently guided by a best before date on the packaging. It may be an agency that, with reasoning supported by the precautionary principle,[176] considers that a food business operator has not demonstrated that a food is safe, even though it may be.

Bradshaw argues that the legal definition of waste leads to increased food waste, and that it should be changed at least in terms of food waste.[177] She uses the formulation that there is an over-inclusive definition of waste.[178] However, the outcome of a conflict between the objectives in different laws cannot be that one law

[172] Luis González Vaqué, French and Italian Food Waste Legislation. An Example for other EU Member States to Follow? *European Food and Feed Law Review, 2/2007 p. 3*. About the French legislation. Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, pp. 311–331.

[173] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, p. 4.

[174] Beatrice Garske et al, Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land. Volume 9, Issue 7 (July 2020)*, pp. 11–13. They also analyze how the Common Agricultural Policy and the Common Fisheries Policy may lead to increased waste of food and what implications tax law can have for food waste.

[175] Dumpstering refers to people taking wasted food out of waste containers to eat it themselves, or give it away.

[176] GFL art. 7.1.

[177] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*.

[178] Ibid., 2018, p. 3.

must give way, but rather that the business may not be conducted unless the requirements of all applicable statutes can be met. This view is not unusual or remarkable in general. These circumstances are of course something that must be considered when the supervising agency, or the legislator, is writing an injunction or proposing a new legislation.

In order not to put the food business operator in such an impossible situation, the agency may not, with the support of one law (e.g., the SEC), order the food business operator to take actions that are prohibited under another law (e.g., food law). The solution may therefore be to ban the activity because it does not meet the requirements of the first law without prescribing what must be done. It is left to the food business operator to find a way that matches both legal packages.

According to the waste hierarchy,[179] preventing food waste is preferable over measures that seek to reuse food via donations for human consumption. In cases where operators resort to the second most prioritized measure, a need to also comply with food safety regulations will be necessary. In the individual case, food safety will probably turn out to be the decisive regulation under which food can be donated, thereby overruling the regulation of resource saving. However, if the operator routinely fails to comply with both regulations, the supervisory agency could require the operator to prevent waste instead of recycling it.

5.3 No court cases on management of resources

We have shown above that there is a clear provision in the Code that requires everyone to take measures to reduce the amount of waste. But what does the legal reality look like? Do the agencies really make demands based on this provision?

To our knowledge, there is in principle no case law where the provision on management of raw materials and other resources (ch. 2, sec. 5) is interpreted, even though it has existed since 1999.[180] However, there are relatively many cases concerning energy saving. To our knowledge, there are also no cases where these rules have been applied by the supervising agencies to the food supply chain.[181] In a highly unscientific search on social media and online forums where relevant supervisory staff could be expected to be active, we found no indications that any agency has even tried to apply these statutes in the food supply chain.[182]

There are many cases concerning treatment of waste, such as transporting, composting, and other kinds of waste handling. (However, the issue is never minimizing the use of raw materials or other resources or reducing the amount of food waste but minimizing odors and other disturbances from waste management.) This is even though there is a specific rule about reducing the amount of waste and minimizing resource consumption (ch. 2, sec. 5). This picture could confirm Bradshaw's view that the EU's waste regulation is primarily about disposing of waste, not reducing its quantities.[183]

There have been court cases where supervising agencies have tried to set requirements for urine-diverting toilets,[184] but the main issue

[179] WFD art. 4 and SEC ch. 2, sec. 5, ch. 15, sec. 10.

[180] Due to relevant case law databases.

[181] We studied court cases in relevant databases such as *JP-miljönet* and *Norstedts JUNO*.

[182] This simple survey does not claim to be scientifically carried out but gives some idea of how the regulations are applied, or rather not applied. This has also been confirmed verbally by senior environmental law expert at Waste Sweden, *Andrea Hjärne*, 11 November 2023.

[183] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*.

[184] With support of SEC ch. 2, sec. 5.

for the courts has not been the possibility to save resources (nutrients), but because urine-diverting toilets are considered a good technology for purifying wastewater of nutrients.[185]

In one case, the court states that: "*The municipality has not been able to give detailed information on the question of the possibilities for disposing of the residual product*", which may indicate that there must be credible provision for the residual product before a requirement for separation can be made.[186] This is not the issue at stake when it comes to reducing waste of food, where the main aim is not to fractionate anything that can possibly be used further, but to directly reduce the use of resources and to minimize the amount of (food) waste according to ch. 2, sec. 5.

However, none of these judgments has been handed down by the Land and Environmental Court of Appeal,[187] which is the court of precedent, so their value may be debated. For this reason, this kind of injunction, or other kinds of decisions/judgements, seems not to have been made in the manufacturing industry, where it is clearer that the SEC is applicable, or among restaurants or grocery stores, where it may be only the resource-minimizing aspect that can be actualized.

In our opinion, this is not a sign that the legislation is not applicable in these situations. Rather, it may be because restaurants are managed by control staff under food legislation, and not by the environmental and health protection staff under the SEC, even though these officers often are colleagues in the same agencies. Of course, the absence of case law does not have to convey the whole truth. The extent to which food business operators on their own initiative, or following requirements through environmental certification systems, introduce measures to save resources has not been analyzed, but can probably be expected to be significant.

An exception is the possibility to apply the SEC to the use of drinking water from running wells. There is in fact a specific statute in the SEC which gives municipalities the mandate to introduce, in specific areas, a permit requirement for individual groundwater sources due to the risks of water shortages.[188] There are quite a few cases in which the local agencies have rejected applications for installation of water-based flush toilets due to shortage of groundwater, or to the risk of shortages.

5.4 Regulating a flow

5.4.1 Introduction

Human extraction of resources from the ecosystem, processing, use of products, and subsequent return of the remains to the ecosystem can be described as a flow. Using the element phosphorus as a model resource, Christensen developed a basis for a flow-oriented regulation.[189] In the same way that a single element can be said to flow through society, human use of raw materials from the animal and plant kingdom and prepared food products can also be considered a flow. What is referred to in food legislation as the food supply chain is a kind of flow.

From an environmental law perspective, the purpose of resource regulation can be to decrease extraction from the ecosystem or to increase return of resources to the ecosystem. Sometimes the remains are called waste, in other cases (air, water, soil) pollution, or in the best case resources that could still be of value. As shown above, what is classified as food waste is often still edible. Along this flow, there are several human

[185] Land and Environmental Court at Vänersborgs District Court, case M 245-11 and M 3580-11.
[186] Land and Environmental Court at Umeå District Court, case M 57-00.
[187] Svea hovrätt, Mark- och miljööverdomstolen.
[188] SEC ch. 9, sec. 10.
[189] Jonas Christensen, *Rätt och kretslopp 2000*.

activities where regulation can be deployed. Where the regulation should be implemented depends on where it can be thought to provide the most benefit and at the same time cause as few unwanted side-effects as possible.

Where along the flow the regulation should be introduced, and the type of regulation that can be assumed to give the best effect, or least unwanted side effects, also depends on the resource. All kinds of resources have fingerprints, or characteristics, which may partly depend on natural scientific conditions (environmental characteristics) and partly on how one uses the resource in society (economic characteristics).[190]

Considering such resource analysis, Christensen proposed that a (resource) flow regulation should comprise two stages. In a first stage, a base regulation would be drawn up, applicable to the use of all, or at least many different, natural resources. However, because such a general regulation would not always have the conditions to consider the characteristics of many different resources, a further and more detailed regulation is needed. In the second step, special rules for utilization of different natural resources would be drawn up, with the possibility to tailor the regulation according to both the environment's characteristics and economic characteristics associated with the specific resource in question.

Regarding the possibilities for influencing a flow of natural resources with different control instruments, it is important to first map certain basic circumstances connected to the kind of resource in question, namely:

a) the importance of knowing which resource utilization is to be regulated; and
b) the purpose of the regulation.

In the latter case, the purpose may be to reduce extraction, to influence the management of resources in society, or to reduce polluting emissions. Based on these facts, the legislator (or the deciding agency) must then assess:

c) where along the resource flow it is expected to be most expedient to introduce the regulation;[191] and then finally decide
d) which legal technique is most appropriate given the specific conditions.

The point of clarifying which resource is to be regulated is related to the fact that different natural resources are distinguished by different specific properties, or characteristics, which can be decisive for the choice of regulation. In the same way, the choice of control means can depend on where in the resource flow the regulation is introduced, just as the purpose of the regulation can also affect how the regulation is designed.

As Gómez-Urquijo points out,[192] in developing countries most food waste takes place in the production and distribution phases. In contrast, in developed countries most food waste occurs in households, requiring legislative measures that affect consumer behaviour. Gómez-Urquijo especially emphasizes consideration of diverse types of legislative measures depending on the type of agent involved.[193]

[190] Ibid., ch. B5. Based on Ester van der Voet et al., 1995. Economic characteristics of chemicals as a basis for pollutant policy. *Ecological Economics vol. 13. 1995*, p. 11–26.

[191] Jonas Christensen, *Rätt och kretslopp* 2000, A8.2. Also, Ingela Lindblom et al., *Åtgärder för att minska svinn i livsmedelsindustrin. Ett industri- och kedjeperspektiv*. Naturvårdsverkets rapport 6959, december 2013, p. 69.

[192] *Laura* Gómez-Urquijo The implementation of EU Legal Framework to Reduce Food Waste: The Case of Spain. *European Energy and Environmental Law Review. August 2022, p. 3*, with sources cited there.

[193] Ibid., p. 5.

5.4.2 Regulating the food supply chain with the Environmental Code

While the *food chain* only describes the flow of food, the food *supply* chain also includes raw materials, growing seed, living animals and food waste. In contrast to this, the entire resource field is covered by the SEC, but the SEC is mainly not focused on the resources themselves (as the food law), but on the activities where resources are handled in some way.

The aim is to reduce wasting of food, which will lead to reduced use of resources but also to reduced emissions, such as climate gases. The fact that the SEC and food legislation are similar in many ways can be expected to facilitate the application of the SEC to the food sector. The following can be stated about both areas of legislation:

- They are based on common administrative law implementation.
- The reverse burden of proof applies as a rule.
- They are technology-neutral.
- They require self-control.
- The supervision/control for the most part (in Sweden) is performed by the same agencies and in some cases, at municipal level, possibly also by the same staff. At regional level, supervision/control is performed by the same agency, but mostly by different departments.

What distinguishes the Swedish environmental legislation is that the general rules of consideration applies to all kinds of individual cases along the entire resource flow (i.e., the food supply chain), regardless of type of resource, the addressee (i.e., the food business operator), or whether the aim is to minimize extraction of resources or minimize emissions etc. Through the regulation on self-control in the SEC, the primary responsibility for maintaining the rules rests with all operators along the entire resource flow. However, it also creates conditions for supervisory agencies along the flow to write and adapt decisions according to the situation in the specific case.

The substantive norms in the SEC, such as the resource management rule, are only applicable in individual cases, i.e., it is not possible for the agencies to direct an injunction to several different addressees along the food supply chain in the same decision. Since the SEC is technology-neutral, it also does not bind the agency as regards how the individual decisions should be designed, or the addressee as regards what the solution should comprise. Usually, it is the result that counts, not how it is achieved, at least when they concern more large-scale operations.[194]

It is our opinion that the resource management rule can be applied along the entire food supply chain, with the aim of reducing waste (or reducing resource use), regardless of whether it is food waste or other types of waste that must be minimized. To our knowledge, this has not been done to date and has not been discussed previously in the legal literature. Christensen calls this kind of generally written legislation "a base regulation", because it can be applied to all kinds of resources at all places along a flow, etc.[195]

5.4.3 Special conditions along the food supply chain

The risks of relying only on such generally applicable base regulation are that it is not possible to consider more specific conditions. Considering how the general rules of consideration are written, it can also be difficult for the addressee to "translate" them to their own situation. Another circumstance is that a decision is required

[194] Land and Environmental Court of appeal, MÖD M 5350-23.
[195] Jonas Christensen, *Rätt och kretslopp 2000*, ch. A7, A9.

in each individual case if an agency wants to enforce compliance.

Therefore, Christensen suggests that this base regulation may need to be supplemented with a more adapted "point-by-point regulation",[196] where the legislator formulates rules for specific resources (kinds of food stuff), at specific points along the flow (the food supply chain) and may also depend on who is addressed (type of food business operator) or the purpose of the regulation. Such spot regulation can be more effective because it is specially designed for a particular situation, resource, or product. When it comes to legislation with the aim of reducing food waste, there may for example be a need to reduce the risks of unwanted cascade- or chain effects as previously described. Bradshaw has also described the general legal concept of waste as having counterproductive effects when it comes to preventing the occurrence of food waste.[197] The general concept of waste tends to often include food that is still edible, which means that large amounts of food are thrown away unnecessarily.

The disadvantage is that such a specific regulation is required for every conceivable situation, which is probably not practically possible. However, it can be a supplement to a base regulation, for certain selected situations.[198] Such rules already exist today in the SEC (e.g., for wastewater treatment[199] and chemical pesticides).[200] An example of such a regulation is the Swedish waste ordinance,[201] which requires municipalities to provide a system to collect food waste that households have separated from other waste and transport the food waste separately from other waste.[202] The French ban on supermarkets throwing away unsold food is another example. Some retailers are there obliged to enter into donation agreements to redistribute food.[203]

Considering Christensen's previous research, it is essential that both legislation and agency/court decisions in individual cases are designed with respect to the characteristics described above, that they are applied in the right situation along the food supply chain (to the appropriate food business operator), and that they contain the types of measures considered most effective. Lindbom et al. (2013) highlights certain specific conditions within the food supply chain that may be important to consider.[204] One is that it may be difficult to target a place along the food supply chain without causing effects (desired or not) at other places in the chain.

> *"From a wasting perspective, it is not possible to cut out neither the industry, the trade centrally nor the stores in isolation from each other from the chain – everything is connected. There are both chain effects and cascade effects between different operators in the chain, which means that food waste occurs at one point in the chain, but the measures must be taken by another of the operators."*[205]

They underline that today, in practice, it is very difficult to work across operators with concrete issues that span two or more operators in the chain, such as returned bread (bakeries – shops) or raw material issues in the meat and sausage chains (agriculture – slaughter – cutting – sau-

[196] Ibid., ch. A8, A9.
[197] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, pp. 311–331.
[198] Jonas Christensen, *Rätt och kretslopp 2000*, ch. A9, 5.4.
[199] SEC ch. 9, sec. 7.
[200] SEC ch. 14, sec. 5–6.
[201] The Waste Ordinance (SFS 2020:614).
[202] Ch. 3 sec. 1 in the Waste Ordinance (SFS 2020:614).
[203] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, pp. 311–331, p. 10 with sources cited there.
[204] Ingela Lindbom et al., *Åtgärder för att minska svinn i livsmedelsindustrin. Ett industri- och kedjeperspektiv*. Naturvårdsverkets rapport 6959, december 2013, p. 68.
[205] Ibid., p. 69, our translation.

sage industry).[206] They also note that there are many relevant facts and discussions on the possibilities to control the handling of food, including the "bullwhip-effect", "responsiveness", food waste that the industry itself can affect and chain-related food waste, operator-internal causes and measures versus operator-common causes and measures, and the importance of knowledge about chain effects and cascade effects.

According to Lindbom et al., it is not possible to formulate a few general measures that reduce food waste in the food supply chain, for any operator.[207] Thus individual measures for each of the operators involved must be designed according to the specific conditions that prevail on the spot. Depending on where food waste occurs, different conditions apply. For example, SFA differentiates between kitchen waste, serving waste, and plate waste when it comes to food waste within meal services.[208]

- **Kitchen waste:** food waste that arises in kitchens.
  Specific conditions: purchase, storage, and cooking.
- **Serving waste:** food that is presented in the serving room, but not eaten.
  Specific conditions: handling of leftovers, serving, portion calculation, and menu planning.
- **Plate waste:** food on the plate that is not eaten.
  Specific conditions: pleasant environment, enough time, and information.

To deal with these types of food waste, different measures must be put in place for each. Liljestrand describes another condition, namely that it is often not possible to access food waste in one particular part of the food supply chain because actions at one food business operator may give rise to desired or unwanted effects in other parts of the chain.[209] She describes several distinct characteristics affecting the possibility of creating a sustainable logistics system for food,[210] such as different locations along the food supply chain (e.g., in primary production) during transport, in processing, or at retail. Other critical characteristics are the type of food, lead time, and whether it is important to maintain the correct temperature in the food. Liljestrand calls these "*food supply chain characteristics*", which she divides into product characteristics and flow characteristics. She also describes how food supply chain characteristics and logistics performance variables influence causes of food waste.[211]

5.4.4 How the Environmental Code may be used today

With the support of the SEC, supervisory agencies can issue various types of decisions, aimed at business operators along the entire food supply chain with the aim of saving resources and reducing the amount of waste. However, the measures required must not be considered unreasonably expensive in relation to their environmental benefits.[212] Moreover, an assessment must always be made in the individual case so that, for example, undesirable effects do not occur at a different point in the food supply chain.

[206] Ibid., p. 73.
[207] Ibid., p. 74.
[208] *Handbok för minskat matsvinn*, p. 6. Livsmedelsverket 2020.
[209] Kristina Liljestrand 6.3.2, *Reducing the environmental impact of food products logistics systems*. Department of Technology Management and Economics, Chalmers University of Technology, Gothenburg 2016. Ingela Lindbom et al., *Åtgärder för att minska svinn i livsmedelsindustrin. Ett industri- och kedjeperspektiv*. Naturvårdsverkets rapport 6959, december 2013, p. 68.
[210] Kristina Liljestrand, *Reducing the environmental impact of food products logistics systems*. Department of Technology Management and Economics, Chalmers University of Technology, Gothenburg 2016, p. 5 and chapter RQ1.
[211] Ibid. ch. 6.3.2.
[212] SEC ch. 2, sec. 7.

The action required must also be proportionate to its effects; *More invasive measures than are necessary in the individual case must not be resorted to.*[213] Some examples are provided below.

Injunction on information or investigations

Before an injunction on action is written, the agency may need more information and a basis for the decision.[214] The following decisions may be made (as examples):

- That the business operator[215] must report to the supervising agency the amounts of food waste thrown away during a certain period, if needed specified in different fractions.
- That the business operator must report measures taken so far to reduce the amount of food waste.

Injunction to present documents

If the agency needs information about what has been purchased, delivered, or thrown away and this can be deduced from written material at the food business, the following decision can be made.[216] This type of written material must be maintained by all food business operators, considering the rules in the food legislation on traceability.[217]

- That the business operator must hand over purchase lists, packing slips, invoice copies, and other specified material to the agency by a certain date.

Injunctions to take actions

Injunctions on actions must, when it comes to larger facilities, primarily be formulated based on what is to be achieved.[218] In special cases, or when they are addressed to private persons or smaller businesses, they can also be formulated more precisely based on what to do.[219]

- If it is clear to the supervisory agency that a certain measure could lead to a reduction in food waste, and this measure appears to be the only possible one, then an order to carry out this measure can be produced. It may be possible to order the following in single cases (although in each individual case, an assessment must be made of whether the measure is reasonable in the relationship between costs and effect):
  - To sell multi-pack products as single items, if one item is spoiled.
  - To reduce the assortment to increase turnover per product.
  - To reduce the fresh assortment in favor of more frozen products.
  - To end take-back agreements and sell out instead.
  - To not reject products without a relevant documented reason.
  - To have active agreements with organizations for picking up leftover foods.
  - To have active agreements with organizations announcing price-reduced items.
  - To not expose more fruits and vegetables to customers than can be sold in one day.
  - To reduce the risk of fruit and vegetables falling onto the floor and being damaged.
  - To more clearly expose foods whose use-by date is soon to expire.
  - To inform customers that it is not harmful to consume a certain food, even though it may be perceived as old.

[213] SEC ch. 26, sec. 9, para. 2.
[214] SEC ch. 26, sec. 21.
[215] Although "food business operator" is not an expression used in SEC, for the sake of simplicity we have chosen to use it here.
[216] SEC ch. 26, sec. 22.
[217] GFL art. 18.
[218] SEC ch. 26, sec. 9.
[219] Land and Environmental Court of appeal, MÖD M 5350-23.

- If it is clear to the supervisory agency that there is certain potential to reduce food waste, and it is possible to achieve this, then an injunction can be issued with a requirement to reduce food waste by a certain percentage by a certain date.

It is not certain that all measures can be enforced with an injunction under the SEC. Some measures could instead be subject to general regulation or enforced through information and education. To our knowledge, this type of injunction has never been tried in court.

Bans and prohibitions

Although bans can be very intrusive to the individual, there may be situations where they should be imposed:[220]

- That the food business operator is prohibited from throwing away food that has not passed the use-by date.

If instead it is a question of an activity subject to a permit, then the same discussion should be held about how permit conditions regarding resource management in general, and food waste, should be designed to have the best effect.

To apply the requirement of best possible technology

It is also possible to apply the requirement for best possible technology to activities in the food supply chain.[221] By technology is meant not only technical installations, but also how an operation is planned, which control and steering documents are used, etc. Such requirements can be set through permit conditions, via injunctions and other decisions, but above all they must be applied by the operator without pressure from the agencies.

Eriksson et al. describe what can be considered the "normal" (voluntary) choice of (best available) technology to reduce wasting of food in the Swedish public catering sector (care homes, schools, and pre-schools).[222] The best-performing food business operators in the public catering sector (among those who participated in that study) considered best (voluntary) available technology to be re-using buffet leftovers, adjusting recipes based on previous consumption, advising guests to start with small tasting portions, setting internal goals for waste reduction, and serving smaller volumes in buffet containers and refilling often.[223] The results showed that with best voluntary practice for each type of catering unit, overall food waste would be reduced by up to 76%.

Eriksson, Bartek et al. shows that through the enforcement of binding regulations, such as best available technology, or market-based mechanisms, surplus bread could be reduced by between 6% and 50%, while also reducing the climate impact with up to 18% compared to the current system.[224] These are "protective measures" that are very specific to the food sector, and in particular to the part of the food supply chain comprising Swedish public caterers. At other stages in the food supply chain, the best protective measures to reduce wasting of food may be completely different.

[220] SEC ch. 26, sec. 9, para. 2.

[221] As commented above, it is often best available technology that will be the actual requirement, not best possible technology.

[222] Mattias Eriksson et al., Making food waste illegal in Sweden – potential gains from enforcing best practice in the public caterer sector. *Sustainable Production and Consumption 35 (2023) 229–237. Elsevier 2022*.

[223] Ibid., p. 237.

[224] Ibid. Louise Bartek et al., *From Surplus to Sustainability: The role of legislation in reducing climate impact from Swedish bread waste*. 2024. (Pre-print: https://papers.ssrn.com/sol3/Delivery.cfm/b118b6c5-afec-467a-9591-9700ec0f699c-MECA.pdf?abstractid=5087054&mirid=1)

Another example is the French prohibition on disposal of safe food intended for human consumption or any of the other purposes of the waste hierarchy (reuse, recycling, recovery).[225] Spain also has a new progressive legislation for reduced food waste that places demands on different operators along the food chain.[226] In the Czech Republic, supermarkets can no longer destroy or throw away foodstuffs they have not managed to sell, but have to offer them to food banks for further distribution to those in need.[227]

5.5 Linking local action to global effects

When it comes to legal requirements to reduce different types of emissions, it may often be easy to link a certain emission to a certain locally polluted recipient (or acknowledge, for example, that a pile of waste can attract rats). When it comes to resource management, this may also be the case (e.g., regarding local resources such as drinking water and a sinking well or access to natural gravel). In other cases (e.g., when it comes to managing a nutrient such as phosphorus) it can be difficult to see the immediate connection between action and effect (such as reduced assets), even though it has long been known that the global recoverable assets of phosphorus may soon run out. One reason may be timely, i.e., there is no immediate shortage today (but in the future). Another can be geographical, i.e., no phosphate-containing ore is extracted in Sweden, (but, for example, in North African countries).

Stopping climate change, which is one reason for reducing food losses, is a similar case, with (often) small local emissions, but with global effects due to production elsewhere and in very large quantities in total. However, when it comes to the question of saving resources (or energy), it may not always be lack of resources in the immediate area, individual municipality, or country or within the EU that should matter, but the discussion must be related to the relevant context, which may be Scandinavian, European, or global.

When it comes to reducing waste of food, the impact on the climate is often cited as an important reason for taking measures, even though it is not always possible for a consumer to link food waste to increased average temperature. The climate impact is expected to be greater in other continents, and in the future. Despite this, action must be taken here and now, and not only because of the local risk of rats around the waste bin in the backyard of a restaurant. In some cases, the wording in ch. 2, sec. 1, para. 2 of the SEC can hinder its application to measures that can lead to climate change since "*a measure refers to a measure that is not of negligible importance in the individual case*".

Given the global objective of sustainable development, in our opinion, the global resource perspective must be considered, as now done in climate discussions. While emissions by one individual may not lead to climate change in Sweden, the country is still prepared to take measures to counteract harmful emissions. The SEC also applies in principle to greenhouse gas emissions, but these are covered by the EU's emis-

[225] Loi n° 2015-992 du 17 août 2015 relative à la transition énergétique pour la croissance verte. Loi n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire, Loi n° 2020-105 du 10 février 2020 relative à la lutte contre le gaspillage et à l'économie circulaire. More comments on this legislation in Laura Gómez-Urquijo, The implementation of EU Legal Framework to Reduce Food Waste: The Case of Spain. *European Energy and Environmental Law Review. August 2022*, p. 13.

[226] Ley de prevención de las pérdidas y desperdicio alimentario provided in December 2021. This legislation in commented on by Laura Gómez-Urquijo The implementation of EU Legal Framework to Reduce Food Waste: The Case of Spain. *European Energy and Environmental Law Review. August 2022*, p. 13.

[227] Nicole Grmelová et al., Measures to Combat Food Waste in the Czech Republic. *European Food and Feed Law Review. 1/2018*, p. 1. The rule was introduced through an amendment to the tobacco legislation.

sions trading system, and it is not possible to set, for example, permit conditions with support of the SEC for activities covered by the EU trading system, as the trading system trumps the SEC.[228]

The distance between the actions of the individual or company and effects in the surrounding environment can also lead to problems with legitimizing various supervisory measures. It is certainly perceived as easier to demand (and understand) legal measures to correct the situation in the local environment than in the diffuse global environment. Clear-cutting rainforest to make room for soy feed production on the other side of the planet or an overheated climate in an unknown future can make it difficult to gain an understanding among the local population for regulatory measures to reduce food waste at local level. While nowadays, in everyday life, you are often met with discussions about how much food is thrown away.

In this context, it is important to remember that reduced emissions and conservation of natural resources are both demands that, with the support of the SEC, must be made for their own sake, as well as to reduce the amount of waste. In our view, it does not have to be shown in the concrete case that there is an acute shortage of a certain resource for savings to be demanded. It is enough that there is a risk and that the resource has great value for humans (or for processes in nature or for the biological diversity). A sparing use of natural resources is also an independent goal (besides environment protection and health care) written in the portal section of the SEC.

In our opinion, one does not initially need to demonstrate a lack of a certain resource for it to be possible to demand its management, since it is a specific goal to save rare resources, in the same way that biological diversity must be protected. The need for the measure can, however, play an important role when it must be shown that the measure is not unreasonable (costly) in relation to the benefits from an environmental or resource management perspective.[229] In the same way, the law states outright that everyone must reduce the amount of waste, without exception,[230] but without this being unreasonably expensive.

Even though the SEC may be applied to activities within the food supply chain, and for the purpose of lowering the waste of food, there may be difficulties in applying the rule of reasonableness to a case where the effect is far away, both in time and space, and when it not only affects a certain specific individual or group of individuals, but also contributes to more or less global problems, such as climate change or global shortage of natural resources, which affect a large but unidentified group of people.

At the core of the problem are three tasks: to be able to assess and measure the damages or losses; to translate these into monetary terms (SEK); and to weigh the damage costs against the costs of the measures imposed on the individual food business operator. While these difficulties exist in practice, lack of robust data is not a valid argument for not applying the SEC for saving resources if it is obvious that the measure is reasonable. This is also the meaning of the precautionary principle, included in the SEC.

The Generational Goal, which was established by the Swedish parliament in 1999,[177] is the overarching goal of all Swedish environmental policy. The goal is: "*to hand over to the next generation a society where the major environmental problems are solved, without causing increased environmental and health problems outside Sweden's borders*". A contemporary interpretation of the Generational Goal is to stay within the Planetary

[228] SEC ch. 26, sec. 9, para. 5.

[229] SEC ch. 2, sec. 7.

[230] SEC ch. 2, sec. 5.

Boundaries,[231] which for the food system can be achieved by combining three major strategies: a global shift towards healthy and more plant-based diets, halving food loss and waste, and improving farming practices and technologies.

The reason for finding a strategy for reducing food loss and waste, among the three major strategies for keeping the food system within safe borders, is a combination of the life cycle impact of food and the magnitude of food loss and waste. Food mainly causes its environmental impact during the production and distribution stages, and only to some extent during the waste management stage, as some countries still landfill food waste, causing methane emissions.[232] Avoiding food waste, and thereby some food production, is thus much more efficient than choosing the best waste treatment option, especially for Sweden and other countries where landfilling is already banned.[233] There is a great need to shift the focus, from waste management to waste prevention,[234] which is a stated goal of the WFD.

Reducing food loss and waste at the many places where it occurs daily is one of the most powerful interventions that can be undertaken for a sustainable food system. Rejecting such a strategy because of an inability to see the connection between a single wasted food and the whole is unnecessary in Sweden, which has legislation that covers the entire food supply chain even if it can be blunt at times.

However, while responsible resource management is one of the cornerstones of the SEC, compliance with this has not been enforced to any meaningful extent to date. Interpretation of the SEC and decisions on activities that should be supervised based on the SEC still seem to focus on end-of-pipe emissions. It was the paradigm two decades ago, before life cycle thinking took over the understanding of environmental impact.

Since food waste does not pose a direct environmental problem at the point of its occurrence, but is rather related to the production of food, the Swedish supervising agencies do not seem to realize that the SEC can be applied to the food supply chain to reduce food waste. This lack of life cycle thinking, or of a flow perspective, will result in failure to achieve the Generational Goal unless the resource management provision of the SEC is applied to its full potential.

6. Discussion and conclusions

According to WFD, EU Member States shall take measures to prevent waste generation, including by reducing food waste. Garske et al. means that despite repeated political statements and initiatives, there is currently no coherent and ambitious approach to tackle food waste along the entire food supply chain in the EU.[235] We believe, however, that the general rules of consideration in the SEC in general, and the resource management rule in particular, have the conditions to at least partially fill that gap for Swedish concerns.

Saving natural resources and energy must be seen as an independent goal in the SEC. The SEC also includes a very clear rule that everyone who runs an activity or takes an action

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[231] *Stockholm Resilient Centre at Stockholm university. https://www.stockholmresilience.org/research/planetary-boundaries.html.*

[232] See Carrie Julia Bradshaw on this issue. *Waste Law and the Value of Food. Journal of Environmental Law*, pp. 311–331. *ISSN 1464-374X. 2018.*

[233] Mattias Eriksson et al., Carbon footprint of food waste management options in the waste hierarchy – a Swedish case study. *Journal of Cleaner Production, vol. 93, 15 April 2015*, p. 122.

[234] Carrie Julia Bradshaw, Waste Law and the Value of Food. *Journal of Environmental Law 2018*, p. 11.

[235] Beatrice Garske et al, Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land. Volume 9, Issue 7 (July 2020)*, p. 14.

must manage raw materials and other kinds of resources in a responsible way and use the opportunities to reduce the amount of waste and to recycle waste as an instrument for this. Although it is not a criminal offense to breach this provision, it is still a form of offence. The more resources (food) wasted, the greater and more serious the violation. This applies to everyone, including private individuals, companies, public businesses, and non-profit organizations. There is no exception for the food supply chain. It is a major shortcoming that ch. 2, sec. 5 of the SEC is never applied in cases of resource management.

Alongside mandatory self-control, public supervision plays an important role in the enforcement of the SEC. With the support of the SEC, requirements can be set on operators, for example, to investigate how much of the resources they use are sold and how much are wasted. Based on such data, the agency can then set a requirement for a specific waste reduction over a certain period. In professional activities, best available technology must be used. This refers to technical installations, but also, for example, to how different processes within the company are structured, and how the business is planned and carried out.

While ch. 2 of the SEC constitutes a general basic regulation that applies to everyone (in the food supply chain), the supervisory agency must adapt its orders to the specific situation and the type of business. The same applies in cases where a permit agency or court formulates conditions in the permit.

Activities do not always result in polluting emissions at site, but raw materials and resources could be consumed, waste generated, and emissions emitted elsewhere. Pollution can have both local and global impacts. Historically (in the era when the SEC was written), it was "only" possible to link a certain activity to a contaminated recipient. However, for at least the last two decades (in the era when the SEC has been in force), it has been possible to connect products to all their emissions and resource use along their life cycle, regardless of where these occur. The connection between wasteful behavior and overexploitation of natural resources is clear from this life cycle perspective, but requires insights into often complex production systems, and could thereby be difficult for the legal system to deal with. The SEC is essentially not designed to regulate utilization of products that are manufactured and used, but only to regulate the conditions under which they are manufactured.[236] This goes back to the fact that the SEC is not essentially product legislation, but mostly focuses on the human activities where products are manufactured, refined, or used. This is also reflected in how supervision in practice is conducted.

While the leftovers on one plate after a meal make a very small contribution, it is easier to link food waste to climate impact if, for example, a school kitchen's total food waste is highlighted and made clear. Admittedly school kitchens and other stationary and regular food business operators are not covered by the exception in the SEC whereby: "*a measure refers to a measure that is not of negligible importance in the individual case*", because in legal terms they are activities and not measures. Regardless of this, emissions of greenhouse gases from food waste are probably so small in each individual case that it might still be difficult to convince a court of the environmental benefits of minimizing food waste for that reason. According to ch. 2, sec. 7 of the SEC, the requirements set with the support of ch. 2 sec. 5 must not be unreasonable in relation to the benefit.

[236] The waste legislation can be considered an exception to this.

However, our interpretation is that considering the SEC's objective rule, i.e., to protect human health, reduce emissions and other pollution, preserve biological diversity, and ensure wise use of natural resources, resource management is, *by itself*, one of the SEC's protective interests and it need not to be linked to deterioration of human health, a polluted environment, or deterioration of biological diversity. This is of course reinforced by the wording that the goal-setting rule must be applied so that these sub-goals are met, with the aim of achieving sustainable development. This view is further strengthened by the fact that in ch. 2 the legislator has chosen to regulate resource management issues in a special provision (sec. 5). However, in accordance with ch. 2, sec. 7, demands may not be made that are considered unreasonable (expensive) in relation to the benefit, an assessment that is affected by how large a contribution the individual business makes.

The SEC has a clear objective regarding the need to reduce resource exploitation. The resource management rule is also a clear substantive norm saying that everyone should reduce the amount of waste, that it should be applied by everyone, and that it should form the basis of both supervisory orders and permit conditions. Likewise, there are well-developed agencies that carries out environmental supervision in Sweden. There is therefore an opportunity for more active supervision regarding the resource management requirement.

Despite this regulatory system and the overall global goal of halving food waste by 2030, as well as the Swedish interim goal of reducing food waste by 20% by 2025, Sweden still has a lot to do. Food waste (in Sweden) has not decreased since 2020, which means that the implementation deficit has not decreased in recent years.

Our view is that if the SEC's resource management provision and the requirement for the best available technology were enforced effectively on relevant parts of the food supply chain, food waste could be significantly reduced. Eriksson et al. have already shown that voluntary application of best available technology in the Swedish public catering sector (care homes, schools, pre-schools) could reduce food waste by 76%.[237] The question is how much food waste would be reduced if the supervisory agencies directed binding orders on such measures against all operators in this sector.

It must be acknowledged that the very generally held resource management provision is not effective at all stages in the food chain. For example, there may be reason to take extra account of the special requirements for food safety in certain situations. Therefore, we believe that there may also be reasons to introduce more specific rules directly tailored to the characteristics that may exist in the food supply chain.

At the same time as our assessment is that food safety must of course come before resource management goals, we and others have been able to observe that both food legislation and waste legislation are in some cases designed so that the regulation forces wasting of food even though food is still objectively safe. It is a task for the legislator to remove such counterproductiveness in the regulatory system.

It is then up to the legislator to find the handling links along the food supply chain where food waste is greatest, i.e., where regulation would be most effective, and design appropriate legislation in accordance with the idea of flow-oriented legislation but without risking food safety.

Sweden and the EU are now tightening the targets on reducing food waste, but the rest of

[237] Mattias Eriksson et al., Making food waste illegal in Sweden – potential gains from enforcing best practice in the public caterer sector. *Sustainable Production and Consumption 35 (2023)* pp. 229–237. *Elsevier 2022.*

the regulatory system must also be altered. It is not enough for the EU to set binding targets – these must be translated into national substantive rules and more effective enforcement rules. There needs to be effective substantive norms that specify and make concrete the measures that must be taken by each individual operator along the food supply chain. There must also be an effective enforcement organization.

It is the MS that are responsible for introducing national regulations that meet the waste directive's requirements for reduced food waste. We believe that Sweden has a good legal basis to stand on, through the resource management rule in the SEC. The problem, as we see it, is that so far it has not been applied to the food chain to reduce food waste.

To achieve this in Sweden, Swedish environmental protection inspectors could learn more about the conditions in the food supply chain, to formulate effective injunctions, or their colleagues, food inspectors, could learn more about using the tools in the SEC. Supervisory agencies need to be trained in how to guide local agencies correctly.

In this article, we only considered administrative law instruments, but of course it is also important to develop other types of control instruments, such as taxes and subsidies.[238] Information and education must also be regarded as important instruments, not least to explain why it is so important to reduce resource consumption and food waste. Further research should be conducted, for example, on where regulation can be expected to have the best effect and which control instruments might be most appropriate. There may also be reason to investigate why the supervisory agencies have not previously addressed this issue and how it can be changed.

[238] Beatrice Garske et al elaborate around economic instruments as an alternative to existing waste legislation. France and Spain have developed tax incentives that enable food business operators donating excess foodstuffs to reduce their tax obligations by a ratio of the net accounting value of the donated food. Challenges of Food Waste Governance: An Assessment of European Legislation on Food Waste and Recommendations for Improvement by Economic Instruments. *Land. Volume 9, Issue 7 (July 2020)*. Nicole Grmelová et al., Measures to Combat Food Waste in the Czech Republic. *European Food and Feed Law Review. 1/2018*, p. 2, with sources cited there.

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