



# Ending waste by law: institutions and collective learning in the development of industrial recycling in Finland



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## ABSTRACT

The European Union's Waste Framework Directive (2008) contains criteria for the legal definition of industrial by-products. The purpose of the criteria is to encourage the reuse of residual materials and to decrease the generation of waste by industry. This article studies how such by-product criteria affect the legal treatment of three different types of residual materials in heavy industrial companies in Finland. Particular interest is in the significance of the role of these by-product criteria in the commercialization of the materials. The results of the article point out that by-product criteria function as a feedback mechanism between the regulative and the operational environments of industries and – to some extent – it also encourages increased interplay between these two realities. By-product criteria evidently promote the utilization of such residues whose product potential is clear. At the same time, these criteria fail in facilitating collective learning related to the development of new kinds of residual-based products. The argument is made that appropriately functioning institutional feedback mechanisms may facilitate the development of industrial processes in environmentally sound directions. At the same time collective learning is urgently needed in the development of industrial systems because processes are often already optimized given existing knowledge. Based on the findings, the article discusses what is required from institutional feedback mechanisms to facilitate collective learning in different operational environments.

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## 1. Introduction

The legal treatment of industrial residues is one of the key issues in industrial recycling (e.g. Gibbs and Deutz, 2007). With effective regulation it is possible to encourage the reuse of materials and to decrease the generation of waste by industries. At the same time, the regulation of residues is also a challenging task and has become a disputed issue in many countries. The legal distinction between definitions of waste materials and by-products has been a particularly controversial question. The question is important for industry because companies can do business with by-products whereas waste management only causes extra costs for them. The legal definition of residual materials is a critical issue also to the wider development of recycling societies. Heavy industries generate considerably more potentially reusable residual materials than any other sector of society. Consequently, industrial companies will play an important role in the achievement of the recycling targets that many countries have set for the future (e.g. Commission of the European communities, 2005; for Finland's

part, see Ministry of the Environment, 2009; Ministry of Employment and the Economy, 2010).

The European Union (EU) wanted to clarify the distinction between industrial waste materials and by-products in member countries and introduced principal guidelines – so called by-product criteria – for a by-product definition in the Waste Framework Directive in 2008 (European parliament and the council of the European Union, 2008). The directive led to waste legislation reforms all over Europe. In Finland, after a long preparation (see Levänen, 2014), a new Waste Act, which includes the by-product criteria in practically the same form as in the directive, became effective in 2012. This article studies how by-product criteria affect the interaction between industrial actors and the authorities. While regulators are continuously expected to develop novel policy tools capable of supporting increased recycling, intensified interaction is also needed because typically the best knowledge concerning the everyday management of processes and materials is in companies and collaborating organizations. Additionally, development of industrial recycling usually requires collective learning about materials and processes, because existing systems are already optimized according to current knowledge (e.g. Sage, 2000).

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The literature concerning the performance of different policy designs emphasizes the importance of feedback mechanisms between the formal institutional setting and the actors' informal ways of doing things in different operational environments (e.g. Dietz et al., 2003; Ostrom, 2005; Dryzek, 2010). Institutional feedback is understood to facilitate learning-based development of operational systems (e.g. Mantzavinos et al., 2004, 76–79; Pahl-Wostl, 2009, 354–356; Heikkilä and Gerlak, 2013, 494–497). Still few analyses have focused on single institutional mechanisms and evaluated their role in enabling the feedback. By-product criteria as a part of the new Finnish waste legislation can be understood as an institutional feedback mechanism because they were particularly designed to enhance two-way communication between the authorities and industrial actors. This article argues that if we want to create policy mechanisms that are able to direct long-lasting changes in the operational cultures of different industries, we need to understand the relationship between regulation and everyday industrial practices better.

An illustrative way to evaluate the functioning of by-product criteria is to focus on the treatment of individual residual materials in selected industrial companies. This article studies the role of the criteria by means of three examples of residual materials, each of which reflects different issues concerning the by-product criteria as an institutional feedback mechanism. The first example is an existing by-product whose legal treatment proved to be problematic under the previous waste legislation. The second example is a component of a new product the commercialization of which was significantly simplified by the new by-product criteria. These two examples demonstrate the change in the commercialization of residual-based products brought about by the new legislation. The third example is a comparative case. It is a potential residual-based product whose legal treatment points out the limitations of the by-product criteria as a facilitator of collective learning related to the development of novel residual-based by-products. The selected examples of materials illustrate how regulation does not solely

determine the treatment of residual materials in companies. Industrial actors' established practices and everyday routines play a noticeable role in the management of materials, and the treatment of residuals is no exception. The treatment of residual materials is fashioned in the interplay between the factors of regulation and the ways of doing things.

In this article, factors of regulation are called *formal institutions* and the ways doing things are called *informal institutions*. Inspired by theoretical literature concerning institutional feedback, hypothesis was made that by-product criteria may intensify the interaction between formal and informal institutional realities, at least in certain circumstances. To organize the study, three research questions were set: (1) How do the by-product criteria of new Finnish waste legislation affect the interplay between formal and informal institutions of industrial residual management? (2) How effectively by-product criteria function as a feedback mechanism between authorities and industries? (3) What is required from institutional feedback mechanisms to facilitate collective learning? The article is structured as follows. The next section introduces the research setting and the analytical framework. The third section explains how by-product criteria function in practice in relation to selected materials. The fourth section discusses the findings and answers the research questions. The fifth section draws brief conclusions from this work.

## 2. Methods

Institutional mechanisms are policy-making tools set by government for a specific purpose. Waste Framework Directive was launched to unify waste management policies in the EU. As discussed above, Waste Framework Directive is important for heavy industries because it provides standardized rules for the legal definitions of waste and by-product. Standardization work, however, remains unfinished in many European areas. If we want to understand the details of the benefits that new waste-related regulation is likely to bring about for the European industries, Finland is an interesting country to observe. Finnish basic industries produce relatively large amounts of utilizable residual materials. The number of these residuals, however, is relatively small. While at the same time it is oftentimes too expensive to transport residuals to other markets, many Finnish companies have gained long-standing expertise in the development of industrial recycling in the neighbouring areas. Companies have also been eager to learn about the advantages that new waste-related regulation may provide for them.

### 2.1. By-product criteria as an institutional mechanism

The novelty of by-product criteria as an institutional mechanism is that it allows industrial companies to consider the potential for their residues to become qualified products. If industrial actors find a suitable product concept, they can appeal to the criteria to change its legal status into a product. If a material meets the requirements of the criteria, the authorities must also accept the change and after that the company can launch the material onto the market. In practice by-product criteria consist of two separate criteria in Finnish legislation, and the details of these are presented in Table 1. The first criterion (“by-product criteria” in Table 1) defines the requirements that a substance or object must meet to become classified as a *by-product* instead of a *waste*. The second criterion (“End-Of-Waste criteria”) defines how a particular waste material may, after certain kind of processing (i.e. “recovery operation”, see Table 1), become classified as “not anymore waste” – in other words as a *product*. In this article, for the purpose of greater clarity,

**Table 1**  
By-product criteria. Adapted from the Finnish Waste Act<sup>a</sup> (646/2011, Section 5).

By-product criteria (requirements for a material to be classified as a by-product instead of a waste.)	End-of-waste (E-o-W) criteria (requirements for a material to become classified as “not anymore waste”; meaning that it is qualified as a product.)
<p>A substance or object is not waste but a by-product, if it results from a production process whose primary aim is not the production of that substance or object, and:</p> <ol style="list-style-type: none"> <li>1) further use of the substance or object is certain;</li> <li>2) the substance or object can be used directly as is, or without any further processing other than normal industrial practice;</li> <li>3) the substance or object is produced as an integral part of a production process; and</li> <li>4) the substance or object fulfils all relevant product requirements and requirements for the protection of the environment and human health for the specific use thereof and, when assessed overall, its use would pose no hazard or harm to human health or the environment.</li> </ol>	<p>Further provisions by types of waste, on when a substance or object no longer constitutes waste, may be given by government decree, if:</p> <ol style="list-style-type: none"> <li>1) the substance or object has undergone a recovery operation;</li> <li>2) the substance or object is commonly used for a specific purpose;</li> <li>3) a market or demand exists for the substance or object;</li> <li>4) the substance or object fulfils technical requirements for specific purposes and meets the existing regulations applicable to similar products; and</li> <li>5) the use thereof will not, assessed overall, pose any hazard or harm to human health or the environment.</li> </ol>

<sup>a</sup> Quotations are from unofficial translation of the Waste Act. Legally binding texts are those in Finnish and Swedish. Both English translation and original versions can be found online from legislative databank of Finland: <http://www.finlex.fi/en/>.

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