The EU waste policy pursues the objective of harnessing waste efficiently back into the production processes in order to establish a circular economy. This dissertation focuses on the ways that the concept of waste and its exclusions, by-product and End-of-Waste status, can impact the achievement of the objectives of the circular economy in the Waste Directive. It analyses the possible interpretations of the legal concepts and the functioning logic of the regulatory system.
THE CONCEPTS OF WASTE AND NON-WASTE IN THE CIRCULAR ECONOMY
Topi Turunen

THE CONCEPTS OF WASTE AND NON-WASTE IN THE CIRCULAR ECONOMY

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ABSTRACT

Perhaps the newest and the most formidable trend of waste policy is the circular economy. In EU waste policy the circular economy pursues an objective of harnessing waste efficiently back into the production processes and to use all of its material potential. The circular economy is included into the waste legislation through the waste hierarchy that lays down the priority order for waste management. The concept of ‘waste’ holds a key position in the European waste legislation. In practice it limits the scope of application of the waste legislation and its obligations: The main rule is that waste legislation is applied to waste and product regulation is applied to non-waste. The dissertation focuses on the ways that the concept of waste of the Waste Framework Directive (98/2008/EC, WFD) impacts the achievement of the objectives of waste hierarchy and ultimately the circular economy. The dissertation analyses the different possible interpretations of the concepts of waste and non-waste in the context of EU environmental law. The dissertation emphasises on the concepts and criteria for by-product (Article 5 WFD) and so called end-of-waste (Article 6 WFD) status. In addition to the legal analysis of the regulation, the functioning logic of the regulative system is evaluated taking into account the objectives of circular economy.

The dissertation concludes that the strict textual interpretation on what is waste does not effectively promote circular economy and therefore the exclusions from the concept of waste (by-product and end-of-waste status) are necessary instruments in the pursuit of circular economy objectives. Considering the ratio of the waste status and its exclusions, the waste status is mostly suitable for materials that are dangerous, useless or unknown. However focusing merely on the waste status of substances and objects can only improve resource efficient use of residual materials in limited situations and other policy measures are also needed in order to comprehensively strive for the circular economy and the waste hierarchy. The thesis argues that the exclusions from the concept of waste only create possibilities for material stream that already have well-established recovery routes and efficient material cycles. The problem is that they create little to no incentives to go further with waste streams with insufficient separation and collection schemes.

Keywords: waste, circular economy, end-of-waste, by-product, waste recovery
TIIVISTELMÄ


Avainsanat: jätteet, sivutuotteet, kiertotalous, end-of-waste, jätteen hyödyntäminen, jäteiden hyötykäyttö
ACKNOWLEDGEMENTS

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In Kallio, Helsinki, 17th of September 2018
Topi Turunen
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### ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>BAT</td>
<td>Best available technology</td>
</tr>
<tr>
<td>BREF</td>
<td>BAT reference document</td>
</tr>
<tr>
<td>C</td>
<td>Official Journal of the European Union, C series (Information and Notices)</td>
</tr>
<tr>
<td>CCA</td>
<td>Chromated copper arsenate</td>
</tr>
<tr>
<td>CCF</td>
<td>Climate correction factor</td>
</tr>
<tr>
<td>C&amp;D</td>
<td>Construction and demolition</td>
</tr>
<tr>
<td>CE</td>
<td>Conformité Européenne</td>
</tr>
<tr>
<td>CEN</td>
<td>European Committee for Standardization</td>
</tr>
<tr>
<td>CEN/TC</td>
<td>European Committee for Standardization Technical Committee</td>
</tr>
<tr>
<td>CEWEP</td>
<td>Confederation of European Waste-to-Energy Plants</td>
</tr>
<tr>
<td>CJEU</td>
<td>the Court of Justice of European Union</td>
</tr>
<tr>
<td>CMTD</td>
<td>Committee meeting</td>
</tr>
<tr>
<td>COD</td>
<td>Ordinary legislative procedure</td>
</tr>
<tr>
<td>COM</td>
<td>Commission document</td>
</tr>
<tr>
<td>DEFRA</td>
<td>Department for Environment, Food &amp; Rural Affairs</td>
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<tr>
<td>EC</td>
<td>European Communities</td>
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<tr>
<td>ECHA</td>
<td>European Chemicals Agency</td>
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<tr>
<td>ECLI</td>
<td>European Case Law Identifier</td>
</tr>
<tr>
<td>ECN</td>
<td>Energy research Centre of the Netherlands</td>
</tr>
<tr>
<td>ECR</td>
<td>European Court Reports</td>
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<tr>
<td>EEB</td>
<td>European Environmental Bureau</td>
</tr>
<tr>
<td>EEC</td>
<td>European Economic Community</td>
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<tr>
<td>EEELR</td>
<td>European Energy and Environmental Law Review</td>
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<tr>
<td>EN</td>
<td>European Standards maintained by CEN</td>
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<tr>
<td>EoW</td>
<td>End-of-Waste</td>
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<tr>
<td>ERFO</td>
<td>European Recovered Fuel Organisation</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>EWCA</td>
<td>England and Wales Court of Appeal</td>
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<tr>
<td>GMO</td>
<td>Genetically modified organism</td>
</tr>
<tr>
<td>ICSG</td>
<td>International Copper Study Group</td>
</tr>
<tr>
<td>INI</td>
<td>Own-initiative procedure</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>IUPAC</td>
<td>International Union of Pure and Applied Chemistry</td>
</tr>
<tr>
<td>Acronym</td>
<td>Definition</td>
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<tr>
<td>JEEPL</td>
<td>Journal for European Environmental &amp; Planning Law</td>
</tr>
<tr>
<td>JRC</td>
<td>Joint Research Centre</td>
</tr>
<tr>
<td>L</td>
<td>Official Journal of the European Union, L series (Legislation)</td>
</tr>
<tr>
<td>MSW</td>
<td>Municipal solid waste</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<tr>
<td>OGEL</td>
<td>Oil, Gas &amp; Energy Law Intelligence</td>
</tr>
<tr>
<td>OJ</td>
<td>Official journal of European Union</td>
</tr>
<tr>
<td>PCB</td>
<td>Polychlorinated biphenyl</td>
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<tr>
<td>POP</td>
<td>Persistent organic pollutants</td>
</tr>
<tr>
<td>RDF</td>
<td>Refuse-derived fuel</td>
</tr>
<tr>
<td>RECIEL</td>
<td>Review of European, Comparative &amp; International Environmental Law</td>
</tr>
<tr>
<td>REO</td>
<td>Rare earth oxide</td>
</tr>
<tr>
<td>SBR</td>
<td>Styrene-butadiene rubber</td>
</tr>
<tr>
<td>SME</td>
<td>Small and medium-sized enterprises</td>
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<tr>
<td>SRF</td>
<td>Solid recovered fuels</td>
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<tr>
<td>SVHC</td>
<td>Substance of very high concern</td>
</tr>
<tr>
<td>SYKE</td>
<td>Finnish Environment Institute (in Finnish, Suomen ympäristökeskus)</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environmental Programme</td>
</tr>
<tr>
<td>UVCB</td>
<td>Chemical Substances of Unknown or Variable Composition, Complex Reaction Products and Biological Materials</td>
</tr>
<tr>
<td>WEEE</td>
<td>Waste electrical and electronic equipment</td>
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1 INTRODUCTION

1.1 THE CIRCULAR ECONOMY

1.1.1 The circular economy as a concept for a new Europe

Waste is no longer considered as simply a burden but also as an important resource in industrial production and energy production.\(^1\) This is due to a new emphasis in global and EU waste policy alongside the fact that prices of resources and raw materials in nearly every production sector have increased.\(^2\) Traditionally, the industry has consumed raw materials in order to manufacture products, and at the same time it has generated waste that was usually considered a burden that the operator needed to dispose of in the proper way. After their initial life-cycles the products also become waste. Harnessing the waste as a resource requires a great deal of regulatory and technical innovation as well as change in people’s attitudes. Nevertheless, due to the ever-increasing volume of waste and the ever-decreasing amount of natural resources, converting waste to resources is a necessary step for the whole world. This should be clear given the problems caused by the sheer amount of waste and the lack of space to store it as well as the environmental and human health hazards it poses.

In 2013, the European Union (EU) published its Seventh Environmental Action Programme under the title ‘Living well, within the limits of our planet’.\(^3\) This programme laid down the main target of transforming the EU into a ‘circular economy’ by 2050. The concept of the circular economy represents a new way to see and understand waste, industrial production and many other aspects of life and ensure that nothing is wasted and that natural resources are managed sustainably.\(^4\) The circular economy is technically a legal concept and does not have any legal implications per se. Hence conceptualising it more strictly is not necessary in this dissertation.\(^5\) The objectives of the circular economy go further than the original waste policies, which sought to prevent environmental and human health impacts and to build on the three ‘R’s (reduce, re-use and recycle). The circular economy is technically not a legal concept and does not have any legal implications per se. It also

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\(^1\) See e.g. Bree, Axel, ‘The Organisation of Waste Management in the European Union Member States’, \textit{JEEPL} 2 (6) 2005, p. 476, for the view that waste treatment can be seen from two different angles: (1) it is a potentially harmful substance that should be handled with appropriate care; and (2) it is a big business with serious economic implications.


aims to boost the EU’s competitiveness and create new business opportunities as well as innovative and more efficient ways of producing and consuming.\textsuperscript{6} Transitioning to a circular economy has the potential to become the grandest European political economy project since the establishment of the internal market.\textsuperscript{7}

This study focuses on the circular economy from a waste perspective, even though the circular economy impacts on all levels of production and consumption. To a great extent, the circular economy scheme is rooted in life-cycle thinking and resource efficiency.\textsuperscript{8} Longer product life-cycles should bring about a reduced need for virgin raw materials and prevent the generation of waste. Nonetheless, shifting to a circular economy requires significant changes in the value chain at all stages of the production process, including new business and marketing models as well as new production methods etc.\textsuperscript{9} Implementing ‘circularity’ in waste management requires numerous different kinds of actions in which the waste is ‘innovated’ or ‘planned’ out of product life-cycles.

In addition to the targets for recovering waste, the circular economy package\textsuperscript{10} seeks to meet many other environmental targets: protection of biodiversity, low-carbon growth, and a safe and sustainable global society. The scope of the circular economy package and its objectives is extensive and hard to grasp as a whole. The main idea, however, is to preserve resources and reduce waste generation during the entire life-cycle\textsuperscript{11} of a product, while aiming to achieve economic growth and social equity. Waste legislation occupies a crucial position in relation to implementing the circular economy package and fulfilling its objectives. The same main objectives are introduced in the waste hierarchy, which is discussed below. Figure 1 illustrates the continuity and multiplicity of product life-cycles in a circular economy.

\textsuperscript{6} COM (2015) 614 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Closing the loop – An EU action plan for the Circular Economy, p. 2. The initial circular economy communication was replaced by the new version but the old version contains important points that help one to properly understand the content of circular economy ideology. See COM (2014) 398 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Towards a circular economy: A zero waste programme for Europe.

\textsuperscript{7} ‘Growth within: A circular economy vision for a competitive Europe’, Ellen MacArthur Foundation 2015, p. 29.


\textsuperscript{11} Or life-cycles in plural as prolonging and multiplying the life-cycle of a product is the focal point of the circularity of the economy. See ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework: By life-cycle I refer to consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal.
The following conceptual diagram illustrates in a simplified way the main phases of a circular economy model, with each of them presenting opportunities in terms of reducing costs and dependence on natural resources, boosting growth and jobs, as well as limiting waste and harmful emissions to the environment. The phases are interlinked, as materials can be used in a cascading way, for instance; industry exchanges by-products, products are refurbished or remanufactured or consumers choose product-service systems. The aim is to minimise the resources escaping from the circle so that the system functions in an optimal way.

Some EU policies and instruments already provide tools and incentives in line with the circular economy model. The waste hierarchy that underlies our waste legislation is leading progressively to adoption of the preferred options of waste prevention, preparation for reuse and recycling, and discourages landfilling. Chemicals policy aims at phasing out toxic substances of very high concern. Some ecodesign measures for energy-related products include requirements on durability and to facilitate recycling. The Bioeconomy Strategy promotes the sustainable and integrated use of biological resources and waste streams for the production of food, energy and bio-based products. Climate policy creates incentives to save energy and reduce greenhouse gas emissions.

A common and coherent EU framework for promoting the circular economy will help bring such elements together with Horizon 2020 to address the research and innovation challenge.

In order to support design and innovation for a more circular economy, the Commission will:

12 See the annex to this Communication.

Despite being complicated, achieving the goals of a circular economy offers significant benefits. The use of cheaper, waste-based materials and a reduced need for virgin raw material cut down the costs involved in the production stage. The need for landfills and other waste disposal operations are also reduced. These factors have considerable economic benefits and promote environmentally friendly production methods. It has been assessed that the economic value of implementing the circular economy package could be as large as 630 billion euros in savings per year.

The circular economy is built on three core principles. The first is to preserve and enhance natural capital by controlling limited resources and balancing renewable resource flows. The second, which this dissertation largely focuses on, is to optimise resource yields by circulating products, components and materials during the lifecycles of technical and biological processes. The third is to foster system effectiveness by revealing and designing out negative externalities such as human health impacts.

**Figure 1. Material cycle in a circular economy.**

Despite being complicated, achieving the goals of a circular economy offers significant benefits. The use of cheaper, waste-based materials and a reduced need for virgin raw material cut down the costs involved in the production stage. The need for landfills and other waste disposal operations are also reduced. These factors have considerable economic benefits and promote environmentally friendly production methods. It has been assessed that the economic value of implementing the circular economy package could be as large as 630 billion euros in savings per year.

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13 See e.g. ‘Growth within: A circular economy vision for a competitive Europe’, Ellen MacArthur Foundation 2015, p. 22: For example, Europe is not running out of resources to mine but these resources are getting more expensive and lower in grade.

Complying with the objectives of the circular economy cannot purely focus on ‘closing the loop’ and the gap between production and generating waste. The environmental and human health impacts of using waste as a resource should also be taken into account. It is often taken as a given that better integration of waste materials within the production process has positive environmental implications.

Turning waste into a resource is a crucial part of closing the loop in the circular economy. As seen in Figure 1, closing the loop is done at all stages of the production process. Efficient waste recovery involves ensuring that precious resources are not consumed too soon and that waste may be re-used in production and in the EU’s economy. It is not simple to harness waste as a significant and reliable source of raw material in the EU. However, in order to bring about technical innovation and a factual shift from the use of virgin raw materials to waste-based raw materials, it is vital that waste can be considered a reliable material stream. Innovations aimed at closing the loop are not attractive if the legal position of the installations using waste is uncertain or made worse than similar installations using virgin materials. Hence, legal provisions affecting waste management and the circular economy are key elements in closing the loop.

Creating a circular economy is a necessary as well as a beneficial step for Europe. Despite EU legislation that promotes sustainable waste management options, Europeans still generate about five tonnes of waste per person per year on average, and only a little more than a third of that is effectively recycled. The timing for implementing a circular economy scheme is opportune: essential enabling techniques are being developed. Europe is experiencing a shift in consumer behaviour, businesses are creating new strategies and higher resource prices are paving the way to allow market and regulatory distortions to be corrected.

The circular economy and the waste hierarchy are the main factors behind the drive towards more effective material recovery from waste. Waste management plays a central role in the circular economy as a means to put the waste hierarchy into practice. In a circular economy, waste management should be based on the best available options from an environmental perspective. Different innovations concerning the regulatory framework on waste or waste treatment technologies may open up new kinds of waste treatment methods, such as landfill mining in which...
landfills can be regarded as constituting temporary storage of material.\textsuperscript{22} Regulatory innovation\textsuperscript{23} will play an equal role alongside technical innovations in seeking to bring about the circular economy.\textsuperscript{24}

1.1.2 Implementation methods for the circular economy

Besides the existing provisions of EU waste legislation, the Commission has drafted an action plan for achieving the objectives of the circular economy.\textsuperscript{25} The action plan lays down a concrete and ambitious EU mandate to promote the EU’s transition towards a circular economy. In spite of this, implementing the scheme successfully, and thus moving closer to achieving the circular economy, will require a huge amount of effort on the part of all the stakeholders involved in the life-cycle of a product. Following, different implementation methods, targets and examples of the functioning of the scheme are set out. The circular economy plan could function as a strong decoupling force between economic and environmental interests.\textsuperscript{26}

The plan for a modified regulatory framework on waste and waste management sets out more ambitious targets for a long-term path for waste management. The key elements of the proposal include:

- A common EU target for recycling 65\% of municipal waste by 2030.
- A common EU target for recycling 75\% of packaging waste by 2030.
- A binding landfill target to reduce landfill to a maximum of 10\% of all waste by 2030.
- A ban on landfilling of separately collected waste.
- Promotion of economic instruments to discourage landfilling.
- Simplified and improved definitions and harmonised calculation methods for recycling rates throughout the EU.
- Concrete measures to promote re-use and stimulate industrial symbiosis – turning one industry’s by-product into another industry’s raw material.


\textsuperscript{23} Regulatory innovations refer to innovative statutory regulation to address the challenges of waste management. See Fromond, Louise & Similä, Jukka & Suvantola, Leila, ‘Regulatory Innovations for Biodiversity Protection in Private Forests – Towards Flexibility’, Journal of Environmental Law 21 (1) 2009, for the analysis of regulative innovations regarding biodiversity conservation.

\textsuperscript{24} Kirchherr, Julian & Piscicelli, Laura & Bour, Ruben & Kostense-Smit, Erica & Muller, Jennifer & Huibrechtse-Trijens, Anne & Hekker, Marko, ‘Barriers to the Circular Economy: Evidence From the European Union (EU)’, Ecological Economics 150 (2018), pp. 267–271. In addition to regulatory and technological barriers, circular economy can also be hindered by cultural and market barriers. A comprehensive shift to the circular economy obviously requires acknowledging all of these aspects. Also see Garnett, Kathleen & Van Calster, Geert & Reins, Leonie, ‘Towards an innovation principle: an industry trump or shortening the odds on environmental protection?’, Law, Innovation and Technology 10 (1) 2018, pp. 7–8.

\textsuperscript{25} COM (2015) 614 final.

\textsuperscript{26} See e.g. ‘Growth within: A circular economy vision for a competitive Europe’, Ellen MacArthur Foundation 2015, pp. 32–34.
• Economic incentives for producers to put greener products on the market and support recovery and recycling schemes (e.g. for packaging, batteries, electric and electronic equipment, vehicles).

The proposed modified regulatory framework also contains a significant amount of proposed new legislation as well as amendments to the ‘old’ legislative framework. The biggest single amendments are made in the directive on waste, the key elements of which, in terms of the regulation of waste, are similar to those set out in the current regulatory framework. The amended version (2018/851/EU) includes more ambitious targets and fine-tunes the interpretation of the provisions and definitions on waste. For example, the modified regulatory framework also includes amendments to directives on packages and packaging wastes and landfills.

The fact that many waste streams can be used as secondary materials that substitute virgin raw materials makes their recovery lucrative. Waste streams such as minerals or oils can in many cases substitute their virgin counterparts with very little pre-processing. This often reduces the environmental impacts of its life-cycle from both ends. The ability to use waste as a substitute requires the waste material to possess a high level of similarity with the virgin material. However, it is also possible to use waste materials that do not directly substitute any virgin raw materials in recovery operations. For example, compost can be used as a fertiliser even if it does not necessarily share the key elements of virgin fertiliser products.

Using waste-based material in production instead of the virgin material can also offer many different benefits due to the physical attributes of such material. For example, the production process for manufacturing products from waste-based copper only uses 35% to 85% of the energy required to manufacture similar products from virgin copper material. Where aluminium scrap is concerned, the energy consumption can be as little as 7% of that required when using virgin raw materials. In relation to paper products the savings are between 20% and 60%. In other words, it is clear that using secondary raw material can offer a huge saving in the energy consumption involved in the production methods. However, all these matters have to be viewed through the lens of life-cycle thinking and in the light of circular economy objectives to see if the waste utilisation schemes can really produce the best outcomes for the environment. The objectives of waste legislation are to minimise waste, minimise the hazardous elements of waste, and produce new material for sustainable industry in the EU.


Using waste materials instead of virgin materials has already amounted to substantial savings in using virgin raw materials in industrial production. If the waste-based material is disposed of, all its material potential would be lost. Re-using, preparing for re-use, recycling and other recovery of wastes can be so efficient that it can save even more raw materials than the actual net volume of the waste material itself. Therefore it is clear that harnessing waste materials to industrial use is essential from the point of view of the circular economy.\(^{33}\)

### 1.2 THE RESEARCH QUESTIONS AND METHODOLOGY

#### 1.2.1 The research questions

Directive 98/2008/EC\(^{34}\) (hereinafter the ‘Waste Framework Directive’ or ‘WFD’) regulates waste in the EU. The functioning of the EU’s waste legislation is, and has always been, greatly dependent on the concepts used in the legislation and the way in which they are interpreted. Furthermore, as with all environmental law, differing and often vague policies, objectives and principles play a big part in interpreting the definitions. EU waste legislation has always been a mixture of strict rules and definitions, together with vague objectives and policies, such as reducing the generation of waste and the impacts that waste has on the environment and on human health. The circular economy is a new way of viewing not only waste management and treatment but also all aspects of industrial production and many aspects of life. This dissertation focuses on the circular economy in relation to the applicable EU legislation on waste, the possibilities offered by the mixture of strict and vague legal instruments described above, and the way in which these elements can complement each other.

The concept of waste and the exclusions from it that are permitted in respect of by-products and end-of-waste products are key elements of the waste legislation. Adopting an over-inclusive interpretation of the concept of waste and the scope of application of the waste legislation might have unintended consequences that would hinder the potential to achieve the goals of circular economy.\(^{35}\) This issue is the main emphasis of this dissertation. Other concepts are also of significance in this context. In particular, the distinction between recovery and disposal is vital as it directly affects the interpretation of the definition of waste and the provisions of the applicable waste

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\(^{33}\)See [http://www.lassila-tikanoja.fi/palvelut/jatehuolto-ja-kierratys/](http://www.lassila-tikanoja.fi/palvelut/jatehuolto-ja-kierratys/) (last visited on 16 May 2016): To demonstrate the savings that can be made through recovering waste materials, a Finnish waste management company, Lassila-Tikanoja Oyj, has calculated the benefits of replacing primary raw materials with secondary waste-based substitutes. Using one tonne of recycled metals saves 1500 kilograms of iron ore and 500 kilograms of coal in metal production. One tonne of recycled plastic equals 1800 kilograms of petroleum when used in material recovery or recovered as energy. Material recovery of one tonne of glass cullet saves up to 650 kilograms of sand, 205 kilograms of sodium carbonate, 190 kilograms of limestone and 80 kilograms of feldspar. Using one tonne of recycled paper as raw material for new paper saves 17 trees and 27,000 litres of water.


legislation. The waste hierarchy is also an important steering method in respect of waste policy and complements the objectives of the circular economy.

The EU’s waste legislation contains many concepts that have been developed through the case-law of the Court of Justice of the European Union (CJEU). This case-law resulted from the problems caused by using an over-inclusive definition of waste in earlier waste legislation, which has in turn been modified pursuant to the cases heard by the CJEU on this issue. Nevertheless, there is no reason to believe that the concept of waste that is currently applicable can be viewed as in any way definitive. Advances in the technology used in production and waste treatment may give rise to unforeseeable situations not provided for in the current legislation, as has also happened in the past in relation to the concept of waste.

The main point of the regulation of waste is to ensure a high level of protection of the environment and of human health. However, waste legislation should also serve the objectives of the circular economy and promote the re-use and recovery of waste in production processes. These objectives may overlap and even be contradictory but they create the wholeness that is required in the interpretation of legislation. Many of these objectives are laid down in the wording of the present EU waste legislation but a number of these merely offer an indication as to how to interpret the flexible provisions contained in this legislation.

The scope of this dissertation entails examination of the concept of waste as an instrument of material efficiency and the circular economy and from the perspective of the concept of waste and the possibilities for exclusion from it. This examination highlights those parts of the waste legislation that are problematic in terms of it achieving the objectives of the legislation and points out interpretative alternatives that offer the possibility to successfully fulfil those objectives. The overview does not solely cover the environmental and human health aspects of the reduction and utilisation of waste, but also considers the economic and legal certainty aspects involved in interpreting and understanding waste in a certain way.36 The research question addressed in this study is as follows:

• How should (1) the concept of waste,37 (2) by-product criteria, and (3) end-of-waste criteria be interpreted under the EU’s waste legislation?
• How do interpretations function with the objectives of waste policy and circular economy and what kinds of barriers laid down in the legislation on waste status hinder achievement of the objectives?

The first research question of the dissertation is a legal analysis of the concept of ‘waste’ in EU law. It is positioned in European environmental law. It takes into account the applicable case-law and evaluates different interpretations in the context of the objectives and trends of modern waste policy and the circular economy.38 The

36 See Malinauskaite & Jouhara & Spencer 2017, p. 67, for the idea that the exclusions from the concept of waste have not been effective in increasing legal certainty on the matter.
37 The dissertation also closely examines the concept of a ‘recovery operation’, as distinct from a disposal operation, because such operations have a vital impact on the concept of waste and the possibilities of creating exclusions from the scope of application of the concept of waste in EU waste legislation.
38 See COM (2015) 595 final, p. 4, for the conclusion that clearer and better formulated definitions play a fundamental role in developing waste management and the circular economy.
methodology of the question is chosen to complement the interpretative features of the field of law in question.

In addition to the traditional focus on legal analysis to interpret the provisions of the existing legal system, the second research question of the dissertation focuses on regulation studies. Hence, in addition to interpreting and systematising the concept of waste and its limits, the research also assesses the position of the existing legal provisions as potential instruments through which to achieve the objectives of the circular economy package.

The two research questions and their methodology are deeply intertwined: The interpretation of legal provisions directly impacts their functioning. The interpretation of the key concepts of the EU’s waste legislation can highlight or surpass the legislative barriers for circular economy objectives depending on the chosen interpretation. The interpretations are restricted to the classic interpretative theories of EU law discussed in chapter 1.2.2.1. The interpretation are made inside the legal framework of EU waste legislation and cannot reach contra legem situations, although European case-law has taken some liberties in the past in relation to the case-law concerning the concept of waste.39 The study aims to identify legal barriers that cannot be removed or affected with the interpretation of the key concepts listed in the first research question. Following chapter on methodology will further clarify the interpretative theory of the legal analysis as well as the meaning of regulation studies portion of the dissertation.

1.2.2 Methodology

1.2.2.1 Methodology of the legal analysis

The research question on the interpretation of concept of waste, by-product and end-of-waste criteria is clearly a question that can be approached purely from the legal analysis point of view. The concepts refer to the concept laid down in the EU regulation on waste and the interface between the waste legislation and product legislation. Therefore the research question should be approached from the viewpoint of interpretative theories of EU law.

Interpreting the concept of waste can be highly complicated. As shown by Cilfit,40 different interpretation methods can be used to analyse the content of interpretable concepts of EU law. The bottom line is that law should be interpreted on the basis of its written version.41 The rationale for this is to ensure legal conformity and legal certainty.42 However, this textual approach is not always sufficient, especially considering the numerous languages used within the EU and the possibility that the regulatory framework either does not exist or is contradictory. Even unclear wording of the law may make the textual approach an inadequate method of interpreting EU

39 The case-law is further discussed in chapter 2.3.2.
40 C-283/81 CILFIT v Ministero della Sanità (1982) ECR 03415.
41 A good example of textual interpretation can be found in C-583/11 Inuit Tapiriit Kanatami ECLI:EU:C:2013:625.
Another way to interpret EU law is to view individual legal provisions as forming part of a system. In this systematic approach, each provision is evaluated and interpreted taking into account the legal framework around it. This approach strives for internal wholeness and effective execution of EU law. The provisions of EU law should not be redundant and each provision of the law must be interpreted in light of its ‘effet utile’, ensuring the instrumental nature of concepts of law, such as concept of waste.

This emphasises the importance of ‘a contrario’ argumentation and the importance of distinction between different operational concepts such as waste and non-waste: the distinction between concepts in the same normative context should be clearly defined and their interpretation should not lead to the same meaning.

The third basic way of interpreting EU law is the teleological approach where the interpretation is done by assessing the objectives and goals of the legal provision and the consequences of choosing a particular interpretation. The argumentation based on the objectives of the provisions in question should be distinguished from the so-called ‘meta-teleological’ approach that refers to a larger systematic understanding of the EU legal order and its objectives. The teleological approach has been criticised for giving too much leeway for the interpretations of CJEU. The debate over the ‘judicial activism’ of the court discusses whether the court should be considered a political actor is still on-going. It is clear that the claim is not totally unfounded and the impacts of CJEU case-law can clearly be traced back to the current wording of the EU waste legislation. However, whether or not the CJEU plays a double role as a court and a political actor, is not relevant from the point of view of the research question of this study.

43 See Paunio, Elina, Beyond Words – The European Court of Justice and Legal Certainty in Multilingual EU Law, Helsinki 2011, p. 55; Bengoetxea, Joxerramon, Multilingual and Multicultural Legal Reasoning. The European Court of Justice, in Kjaer, Anne Lise & Adamo, Silvia (eds.), Linguistic Diversity and European Democracy, Ashgate 2011, p. 97–122, for the point that textual (or linguistic) arguments works best as supporting arguments that confirm or clarify the debate on the interpretation.


45 A good example of systematic interpretation can be found in C-402/07 Sturgeon and Others (2009) ECR I-10923.


48 A good example of teleological interpretation can be found in C-22/70 Commission v Council (1971) ECR 263.


The taking of other approaches in preference to the textual approach is in general
mostly justified in ‘hard case’ situations. The basic rule is that the other approaches
should not call the textual interpretation into question unless the wording of an EU
law provision is not clear and precise.52 It must however be noted that the distinction
between the approaches is rarely as steep: for example the textual sources of law are
shaped by teleological assumptions and objectives and while interpreting it is up to
the court to decide whether it can extend the purely textual argumentation towards
the desired conclusions or if it is willing to give voice to the teleological approach.53

Where the textual approach is followed, the arguments used are based on the
semantic and syntactical features of the legal language and on comparison of the
different language versions that are authentic under EU law. However, due to the EU’s
multilingualism the CJEU has ruled that arguments may not be based on linguistic
divergences or the multiplicity of verbs used since the meaning of provisions must
determine by reference to their objectives.54 The main idea behind the systematic
approach and context-established arguments is that EU law is to be understood only
when placed in a wider context: the interpretative guidelines are to be found in the
context of the provisions of EU law. The problem with this approach is that it depicts
EU law as being a static system in which legal interpretation is not susceptible to rapid
functional alterations in interpretation.55 Furthermore, it is not always easy to establish
the context from which the relevant guidelines may be drawn.56 The teleological
approach can be used to complement these interpretative approaches by extending
the scope of interpretation outside the wording or context of the written law.57

The teleological approach offers a more dynamic means of interpreting EU law.58
Teleological arguments are drawn from the conception that interpretation should
be made in such a way that the norms effectively function, or that it should be
made on the basis of the objectives explicitly formulated by the norms, or
which the norms are seen to pursue, and furthermore, in the light of the consequences that
will flow from the proposed interpretation of those norms.59 It has been argued that
teleological argumentation should be available only when textual approach fails

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52 See e.g. Case C-582/08 Commission v United Kingdom (2010) ECR I-07195.
No. 53/2013, pp. 9–10.
54 C-61/73 Mij PPW International (1973) ECR 301. Other case-law on textual approach includes C-13/83
Parliament v Council (1985) ECR 1513; C-107/84 Commission v Germany (1985) ECR 2655; C-152/84 Marshall
(1984) ECR 723; C-148/78 Ratti (1979) ECR 1629 etc.
55 See Bengoetxea, Joxerramon, The Legal Reasoning of the European Court of Justice: Towards a European
Jurisprudence, Clarendon Press 1993, pp. 234–251, for the point that the mixture of systematic and teleological
interpretation, teleo-systematic interpretation, has been criticised for its overly dynamic nature.
56 C-28/67 Molkerei-Zentrale (1968) ECR 143; C-188–190/80 France, Italy and UK v Commission (1982) ECR
2545; C-61/81 Commission v UK (1982) ECR 260; C-69/80 Worthingham v Lloyds Bank (1981) ECR 676 etc.
Paunio 2011, p. 56. See Lasser, M., Judicial Deliberations: A Comparative Analysis of Judicial Transparency and
Legitimacy, Oxford University Press 2004, pp. 211–229, for the point that CJEU case-law is often based on a
small number general and abstract purposes.
57 See Bengoetxea 1993, pp. 234–251.
58 Reich, Norbert, Understanding EU Law – Objectives, Principles and Methods of Community Law, Intersentia
2005, p. 31.
59 Bengoetxea 1993, pp. 251–252. This is a bit of an extended version of the normal definition of teleological
approach, but describes very well, in my opinion, the interpretation alternative available for EU norms.
provide a clear interpretation and the direct application of teleological argumentation was referred to as ‘radical teleological method’.\(^\text{60}\) However, Peczenik claimed that teleological interpretation is applicable already at the beginning of the interpretative process and not only after other interpretation methods.\(^\text{61}\) It is rather common that objective-oriented and purpose-driven interpretative methods play a central role in interpretation of environmental law.\(^\text{62}\)

This approach of seeking justification by reference to consequences or effects is used a lot in CJEU case-law.\(^\text{63}\) It must be taken into account, however, that a teleological argument is not necessarily dynamic since the purpose or telos might derive from legal tradition.\(^\text{64}\) On the other hand, teleological argumentation may leave too much leeway for interpretation where the legislation contains multiple and possibly contradictory objectives. In this dissertation the systematic and teleological methods are understood as involving an approach to the interpretation of the norms both in the context of EU environmental and waste legislation and by reference to the objectives of those legislative branches, giving a good foundation to the assessment and development of the use of de lege ferenda regulation in the field of waste management.\(^\text{65}\)

These interpretative methods of EU law are limited to certain sources of law, which, through systematic and teleological argumentation, function both as objects of interpretation through the interpretative approaches and as supplementary materials for interpretative purposes. Bengoetxea highlights that the term ‘sources of law’ can be used in different ways. It can refer to (1) sources of law-making; (2) sources of decisions; (3) sources of information concerning the legal norm; (4) functional sources of law, which are those aspects of social life that lead to the creation of law such as new technology; and (5) historical cultural phenomena which have an influence on a given legal culture. This dissertation largely limits its discussion of sources of law to the first four categories. The functional sources of law are used when this is necessary due to the object of regulation.\(^\text{66}\) As with interpretative approaches, the field of acceptable and available sources of law gets larger with the complexity of the cases and the practical necessity of using alternative materials in the pursuit of a functional and effective solution to the interpretative problem at hand.

The EU’s multilingualism and the technicality of the subjects of regulation are factors that emphasise the importance of certain functional interpretation methods and the use of different sources of law where the objectives of the legislative framework are taken into account. The most strictly binding sources of EU law (hard law) are not always sufficient to address all possible situations in which a given provision may be applied. As is the case for most elements of environmental law, the interpretation

\(^{60}\) Derlén, Mattias, Multilingual Interpretation of European Union Law, Kluwer Law International 2009, p. 45–47


\(^{62}\) See Määttä, Tapio & Soininen, Niko, Ympäristöoikeudellisen ratkaisun teorian rakennesoti ja ominaispiirteet, Lakimies 7-8/2016, pp. 1034–1041, for more on the basic interpretative models and their challenges.


\(^{65}\) Maduro 2007, p. 5, According to Maduro the telos of the regulation is not limited to the rules but also to the legal context of these rules.

\(^{66}\) Bengoetxea 1993, pp. 64–65.
of EU waste legislation is not possible solely through the textual approach and by reference to hard law sources. It is not as though all these cases concern unclear provisions of law or unclear interpretative situations where a judgment cannot be given solely on the basis of the textual interpretation method under EU law. In order to interpret environmental law, especially according to its telos, the environmental problems will have to be understood. In waste legislation this kind of expansion of interpretative methods and sources of law can proceed from the technicality of the regulated subject. Understanding the outcomes of different interpretations also requires keeping up the technical debate on the subject.

The technical characteristics and complexity of the regulated subject may call for a form of governance where the original legal provision is left open to be complemented after the required technical and scientific data has been developed. Methods of this kind are commonly used in relation to framework directives such as the WFD. The technicality and complex nature of the regulated subjects have often been the main grounds for the delegation of legislative and, especially, executive powers under EU law. Continuous technical and scientific development has to also be taken into account in the interpretation of environmental law provisions.

The need for technical data in the regulation and execution of the legal provisions clearly show that the systematic and teleological approaches gain new forms in the legal interpretation of the more complicated provisions of EU waste legislation. That is why, when necessary, technical and scientific documents on interpreting the provisions of EU waste law are used to complement the more binding sources of law when they do not provide sufficient information on interpretation of the provisions. These documents comprise, in particular, end-of-waste studies and technical report drafted by the Joint Research Centre (JRC). These soft law sources can create binding effects in respect of legal interpretation by concretising flexible provisions of law. Where the case-law and hard law provisions are insufficient

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72 Pink, Grant & Bartel, Robyn, ‘Regulators networks: collaborative agency approaches to the implementation and enforcement of environmental law’, in Martin, P. & Kennedy, A. (eds), Implementing Environmental Law, Edward Elgar 2015, pp. 319–320, Producing technical information has intrinsic value. The technical data in regulation aims pursues the achievements of the objectives of the regulation.

73 ‘Functional sources of law’, as Bengoetxea has it.

74 Fisher et al. 2010, p. 267, This kind of materials are interdisciplinary scientific data that may have relevance to policy-makers purposes but can also be drafted with policy-making in mind straight from the start.

these research materials will be used together with the classic legal interpretative methods and sources of EU law.

In addition to strictly sticking to the interpretation of the legal provisions, the dissertation also includes a systemising dimension as legal analyses normally do. The idea of systemising is that the system is 1) complete, 2) consistent and 3) eliminates the ambiguities related to the interpretation of the provisions.\(^76\) In this dissertation it means examining the provisions as a part of larger, complete entirety: as a part of waste regulation and in connection to other regulatory systems such as chemicals regulation. The systemising in this study pursues the objective of defining the relationship between single provisions applied to waste-based materials and in this way, creating a coherent legal system for the achievement of the objectives of circular economy. The systematisation of the provisions serves the purpose of synthesising the different regulatory systems in order formulate a complete circular economy system.\(^77\) System-thinking is deeply related to the teleological and objective-oriented interpretation of law, as a reasonable environmental law system cannot be constructed without objective-oriented argumentation. On the one hand the objective is defining the system, while on the second hand the legal system restricts the interpretations from becoming arbitrary.\(^78\) Therefore reasonable interpretations of the key provisions of the waste legislation require a systematic framework. In the case of transitioning from waste legislation to product legislation, the systematic framework can actually be a combination of two different legal systems.\(^79\)

1.2.2.2 Methodology of the regulation studies

The second research question regarding the instrumental nature of the concepts and the barriers for circular economy cannot be assessed solely on ground of legal analysis and the interpretative theories of EU law. The traditional internal view to law is adopted in the first research question through the legal analysis approach and the interpretation theories of EU law. However, the second question embraces the approach of describing the law from the outside (external view).\(^80\) The internal view to law represents the view of legal scholars that aims to approach the law using its own concepts. The external view to law represents the interest of social sciences: the beliefs that the members of a society have of legal norms and which causally influence their behaviour.\(^81\) Kornhauser adds that “An internal theory -- uses the concepts available to participants in the practice that the theory explains; an external theory, by contrast, uses whatever concepts best explain the practice in question whether


the participants have or do not have those concepts”. Both perspectives to law offer their own benefits. However, the external view traditionally has a leading role in evaluation research since law itself cannot explain its impacts. Nevertheless, this dissertation also has genuine knowledge interest in legal analysis and the internal view to law as there are considerable obscurities in relation to interpreting the EU concept of waste. Although the legal analysis is heavily based on teleological interpretation and argumentation – as is usually the case in relation to environmental law – the objective-oriented interpretation in the internal view to law does not really provide knowledge for the external knowledge interest to law. Therefore, the methodology of the dissertation is extended to include regulation studies.

As no empirical data is used in this dissertation, the evaluation through the external view to law is necessary in order to get information on the functioning of the legal system. It is rather common to assess a regulatory instrument on the basis of the capacity to affect the preferences and behavior of relevant stakeholders rather than how they might affect the overall environmental outcome. Nonetheless, the evaluation is not possible if there is not a predetermined evaluative framework that the results may be mirrored against. Traditionally terms such as ‘good regulation’, ‘better regulation’ or ‘smart regulation’ are used as tools for the quality of the regulation in the evaluation of the regulation. However, the evaluation of the regulation cannot

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84 Similä, Jukka, Regulating Industrial Pollution – The Case of Finland, Helsinki 2007, p. 32.
86 See Similä, Jukka, ‘Ympäristöpolitiikan ja arvioinnin näkökulma’ Oikeus 31 (2) 2002, p.187, for the point that assessing environmental effectiveness of the regulation can be hard even with the empirical data due to the fact that it is complicated to demonstrate the causality between the legal action and the environmental impacts. Also see Kokko, Kai, Methods of Environmental Law in Finland, Scandinavian Legal Studies 1999–2015, p. 303, for the point that empirical studies do have their benefits in effectiveness studies.
90 See Gunningham, Neil & Grabosky, Peter, Smart Regulation – Designing Environmental Policy, Oxford University Press 1998.
completely take place inside these categories since there is no clear consensus on their content. To assess the quality of the regulation it is necessary to select a fixed evaluation criterion or criteria. There are many different evaluation criteria for the quality of environmental regulation and though all of them could be used in the evaluation, some of the most common criteria would seem to be (environmental) effectiveness, efficiency and equity. Making choices between evaluative criteria is mostly up to the evaluator and depends on the knowledge interest of the evaluation.

The regulation studies side of this dissertation does not directly aim at examining any of the most common criteria of evaluation of environmental law but aims to evaluate the functionality of the legal system. The functionality indirectly refers to the effectiveness of the regulation. The dissertation studies the functioning logic of the instruments examined. The examination of the functioning logic aims to identify problem area and loopholes of the regulation that could later amount in ineffective regulation. In this dissertation the knowledge interest is on whether the concepts of waste and non-waste can function as instruments of circular economy. In other words, do the examined legal instruments (regulation on waste and non-waste status) compliment the objectives of circular economy in an environmentally effective way when rationally applied? The environmental effectiveness should be evaluated in the light of the intended objectives of the policy. Basically the effectiveness of the regulation assesses the degree to which a policy instrument contributes to its objectives. The evaluation of effectiveness is mostly carried out through, what Vedung calls, ‘goal-

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91 See Similä 2007, pp. 26–27, for the point that the quality of the regulation is a complex notion that requires selection of evaluation criteria.


93 See Pölönen, Ismo, ‘Paikallisten osallistumisoikeudet malminetsintä- ja kaivoslupavaiheissa – Uuden kaivoslain arviointia’, *Ympäristöjuridiikka* 2/2012, p. 72, footnote 7, for the use of similar view in this research and calling it ‘lakitekninen toimivuusarviointi’ which roughly translates to the evaluation of functioning through legal technique.


attainment evaluation’ that assesses the results of the regulation according to its goals and the results produced by the regulation.97

As noted above, this dissertation cannot be categorised in the category of environmental effectiveness studies since it rather studies the potential and the logic of the legal instrument in order to reach the environmental effectiveness. If the functioning logic of the legal instrument is poor or completely lacking there is a risk of theory failure in the regulative framework. Theory failure refers to situation where the regulation does not produce the immediate effects that were expected or intended.98 In the context of this dissertation this means that the concepts of waste and non-waste would not impact the utilisation of waste-based materials in the desired way. The evaluation of the functioning logic explains how far the regulatory instrument (and its interpretative reach) can go in pursuing its objectives and what gaps will still remain open despite the application the instrument.

The evaluation of the functionality or the effectiveness of the regulation on concepts of waste and non-waste is impossible if the objectives of the regulation are unknown. It is clear that the ultimate objective of waste legislation, as is with most environmental law, is the protection of environmental and human health.99 Nonetheless, in relation to waste legislation, there are two separate routes to strive for best possible outcome in environmental protection: 1) to provide extensive rules for waste management so that possibly harmful wastes would be disposed and removed from circulation in order the avert their negative impacts to the environment and human health, and 2) to harness the waste back into production processes reducing the need for raw material extraction and landfilling.

Traditionally waste legislation applies to all materials that are disposed and ensures their safe and healthy disposal.100 The earlier interpretations of the concept of the waste aimed at making sure that its scope of application is as vast as possible in order ensure the safe disposal of waste. However, the later development of the interpretations acknowledged that not all materials that would normally go under the concept of waste are waste. Clearer regulation on what is and what is not waste aimed to further encourage the utilisation of waste in the EU creating legal certainty and a level playing field between virgin and waste-based raw materials as well as removing unnecessary administrative burdens.101 The EU waste legislation experienced a paradigm shift,

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97 Vedung 1997, pp. 37–38, 43, The goal-attainment evaluation does not take into account the costs of the regulation and this not been done in this dissertation either.
99 See chapter 1.4.2.
moving from the conception that waste was always harmful to a realisation that waste could actually be a substitute for virgin raw materials.\textsuperscript{102}

A similar view is emphasised in the circular economy strategy.\textsuperscript{103} In the end, the objectives of the regulative system distinguishing waste from non-waste materials are similar to ones laid down for waste management in circular economy. The importance of examination of the functioning logic is emphasised by the fact that the paradigm of waste management has shifted from the initial target of safe waste disposal to closing the material loop through circular economy. As an instrument the differentiation between waste and non-waste has been in the waste legislation for a long time, and therefore it should be ensured that the system is complementing the new objectives of modern waste policy.

The evaluation of the functioning logic of the concepts of waste and non-waste against the framework of waste management in circular economy is a natural step forward taking a more ambitious view towards elevated objectives for waste management and treatment. In short, where the dissertation discusses whether the regulation or its interpretation complement or hinder the achievement of circular economy objectives, it is actually debating whether the functioning logic of the instruments holds. If not, the regulation is prone to be ineffective and its application would not lead to the objectives of circular economy.\textsuperscript{104} This way the external view to law can function as an instrument for the evaluation of whether the conceptual instruments really carry out the objectives of circular economy and help to improve the quality of regulation.

1.2.3 Positioning the study into the context of other research

There are three defining features of this dissertation: 1) it is a study on European circular economy, 2) it is legal analysis of EU waste legislation and 3) it is a study that combines the methods of legal analysis and of regulation studies. The concept of circular economy and the circular economy strategy are rather new in European legal systems. Therefore the wide potential of legal research in this area has remained rather untapped. Thomas de Römph made his doctoral thesis on the topic of waste legislation and circular economy.\textsuperscript{105} De Römph’s point of view also explores the different instruments of striving for circular economy but does not focus on concepts of waste and non-waste but other measures of EU waste legislation, ecodesign, European

\textsuperscript{102} COM (2014) 398 final, pp. 2–3, 12–13; COM (2011) 571 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions – Roadmap to a resource efficient Europe, p. 10.

\textsuperscript{103} See COM (2018) 32 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions on the implementation of the circular economy package: options to address the interface between chemicals, products and waste legislation, p. 5, for the point that End-of-Waste regulation and its further harmonisation have a huge potential as a driver towards circular economy.

\textsuperscript{104} This kind of frames of environment law are in constant flux and contestation and it is necessary to keep track of their development and try to untangle the complexity of the situations by identifying and addressing them. See Fisher, Elizabeth, ‘Environmental Law as ‘Hot’ Law’, \textit{Journal of Environmental Law} 25 (3) 2013, pp. 347–348, 355.

\textsuperscript{105} De Römph, Thomas, \textit{The legal transition towards a Circular Economy – EU environmental law examined}, Leuven 2018.
standardization and chemicals regime. The doctoral dissertation of Joonas Alaranta examined the circular economy from the point of view the chemicals regulation.\textsuperscript{106} The dissertation of Jarkko Levänen studied overcoming the institutional obstacles of industrial recycling through case studies in the field of social sciences.\textsuperscript{107}

The concept of circular economy has also been studied in other sciences such as environmental policy research by Fenna Blomsma\textsuperscript{108} and Olli Sahimaa\textsuperscript{109} in Technology. Harri Kalimo’s “E-Cycling: Linking Trade and Environmental Law in the EC and the U.S.: Linking Trade and Environmental Law in the EC and the U.S”\textsuperscript{110} is a good example of research acknowledging the material potential of waste although technically the term and the idea of circular economy was not established in European legal thinking.

EU waste legislation has been more popular subject of regulation than circular economy and has a long tradition legal research. Like this dissertation, a big part of that research has focused on concept of waste and non-waste. Research consists mostly of articles and case-law commentaries but larger research project on the subjects are lacking. This dissertation widely refers to this literature but assesses the concept of waste and non-waste from the perspective of the new circular economy strategy and the relatively new criteria for by-product and End-of-Waste status. In addition to the articles, a more comprehensive perspective to EU waste legislation has been taken in many seminal works of environmental law which are also referred to in this dissertation. Perhaps the most important single book is the 2015 EU Waste Law\textsuperscript{111} by Geert Van Calster. Harry Post has also edited three research books on different areas of waste management: general EU waste management with an example from Italy\textsuperscript{112}, radioactive waste management\textsuperscript{113} and Waste-to-Energy.\textsuperscript{114}

Although waste legislation is not the most common research subject of either EU or environmental law, the methodological mixture of legal analysis and regulation studies has been rather common in the environmental law dissertation for some time due to the instrumental nature of environmental law. An early take on the modern

\textsuperscript{106} Alaranta, Joonas, Kemikaalit ja kiertotalous – tutkimus huolta aiheuttavien aineiden ja materiaalikierron sääntelystä REACH-asetuksen mukaan, Dissertations in Social Sciences and Business Studies, University of Eastern Finland 2018.

\textsuperscript{107} Levänen, Jarkko, Overcoming the Institutional Obstacles of Industrial Recycling, Publications of the Department of Social Research 2015:16, University of Helsinki.


\textsuperscript{109} Sahimaa, Olli, ‘Recycling potential of municipal solid waste in Finland’, Helsinki 2017.


\textsuperscript{111} Van Calster 2015a.


methodology of environmental law can be seen in Jukka Similä’s “Regulating Industrial Pollution – The Case of Finland”.115 The concepts of the evaluation were also closely examined in Per Mickwitz’s “Environmental Policy Evaluation: Concept and Practice”116 even though it is not technically an environmental law dissertation.

After these dissertations, the combination of the internal and external view to law has become more common in domestic environmental law dissertations. In Suvi Borgström’s dissertation on the conservation of wolves the regulation is looked from both internal and external point of view: the acceptability of the legislation on the conservation is examined from both legal and ecological perspectives and instrument of the conservation are widely discussed.117 Ilari Hovila also evaluates environmental regulation in his dissertation on legal policy instruments in municipal land use.118 Despite what the author has written, the legal analysis is not at focus of this dissertation: Hovila is much more interested in the policy instrument evaluation which has been emphasised in the dissertation even though this is not clearly stated in the methodology of the dissertation.119

Seita Romppanen balanced the legal analysis and evaluation perspective in her dissertation “New governance in context: evaluating the EU biofuels regime”.120 Just like this dissertation, a great portion of Romppanen’s dissertation was based on legal analysis but the knowledge interest of the study required an evaluation of the regulation as well. Lea Halonen wrote her dissertation combining the methodology of legal analysis and regulation theory on water protection and ditch network maintenance.121 The main aim of the dissertation was to assess whether the water protection regulation enables the achievement of the water protection objectives laid down. Jussi Kauppila’s dissertation explored how river basin management plans have affected administrative decision-making and the progression towards ‘good status’ of surface waters.122 The evaluation is based on the intervention theory of the author and focuses on the effectiveness of the river basin management plans system.

When compared to other similar studies, this dissertation aims to address the research questions from a rather practical point of view. The evaluation of the regulation is focused clearly of the functioning logic of the legal measures and a lot of emphasis is put on answering questions of interpreting the existing provisions on waste and non-waste. The study and the methodological choices made in it underline that the instrumental (and institutional) concepts such as ‘waste’ can only serve their

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116 Mickwitz 2006.
119 The opponent’s statement on Hovila’s dissertation.
120 Romppanen, Seita, New governance in context: evaluating the EU biofuels regime, Dissertations in Social Sciences and Business Studies, University of Eastern Finland 2015.
121 Halonen, Lea, Metsäojitukset ja vesiensuojelusääntely: sääntelyteoreettinen tutkimus vesiensuojelusääntelyn toimivuudesta, Dissertations in Social Sciences and Business Studies, University of Eastern Finland 2016.
122 Kauppila, Jussi, Vesienvoitosuunnitelmassa oikeudellisen vaikuttavuuden rakentuminen, Dissertations in Social Sciences and Business Studies, University of Eastern Finland 2016.
purpose as part of functioning legal system if their interpretation is also evaluated beyond legal rhetoric and internal view to law.

1.3 SPECIFICATION OF THE STRUCTURE, SCOPE AND AIMS OF THE STUDY

1.3.1 Scope and aim of the study

The dissertation strongly emphasises enabling waste recovery operation and removing barriers (or so-called ‘bottlenecks’) for the utilisation of waste but by no means suggests that these options should be available without considering the need for a high level of environmental and human health protection.123 The dissertation proceeds from the assumption that all provisions of waste legislation potentially promote the objectives of the WFD and the circular economy on different levels. Sometimes these mechanisms may overlap or there may be tensions between them and it is clear that coherence between different mechanisms and different waste streams is necessary in order to make informed decisions on effective waste management. This has positive impacts on the objectives of waste policy as well as in terms of achieving legal certainty in relation to waste management. Legal certainty within the field of waste management benefits the EU and national authorities as well as all other stakeholders and investors in the long term. Private parties have a substantial role in the circular economy plan in terms of waste generation and using raw material, and should have an equally large role in waste prevention, recovery and disposal and in creating a sustainable framework for using natural resources. Achieving the objectives of the circular economy is a joint effort between public and private parties.124

This dissertation concentrates on drawing a line between waste and non-waste and seeks to define a standard for the kinds of substances and objects that should be considered waste or, alternatively, non-waste. The WFD has inbuilt mechanisms to exclude substance and object from the concept of waste. Waste status should represent a purpose: substances and objects that cannot be used safely in production processes without the governance of waste legislation should be considered waste; a contrario, those that can be utilised in a safe manner outside waste legislation should be considered to be something else.125 If the additional legislation governing a substance or object that is considered waste is not justified on the grounds of necessary control measures in the light of its environmental and human health risks, the regulatory framework does not serve its rightful purpose. The basic rule is that materials that

123 See Van Calster, Geert, EU Waste Law, Oxford University Press 2015, pp. 16–17, for the view that the high level of environmental protection and the precautionary principle laid down in Article 191 TFEU make it impossible not to take these values into account in interpreting the concept of waste in the EU or in Member States.


125 As discussed in the later chapters, this type of logic deriving from the systematic approach to EU law interpretation has been applied in respect of the EU’s waste legislation through case-law and later enactments. Nevertheless, the introduction of new innovations and waste streams indicates that there is always room for interpretation.
can be safely recovered should stay in the recovery loop and materials which use has serious environmental or human health risks should be removed from circulation.

The aim is to explore better ways of regulate on preventing waste generation and promoting waste recovery and to apply a clearer interpretation of the concept of waste and its exclusions. In this way many unnecessary disposal operations could be avoided and waste-based materials could serve a beneficial purpose as substitutes for raw materials and have a longer or multiple life-cycles.

1.3.2 Structure of the study

The study consists of six chapters. This first chapter introduces and explains the background, methodology and objectives of this study. The second chapter focuses on the key concepts used in the WFD and this study, and examines the three most important definitions contained in the WFD in relation to the objectives of this study: the waste hierarchy, the distinction between recovery and disposal operations, and the basic concept of waste in EU waste legislation. The third chapter deals with the exclusions from the concept of waste of contained in EU waste legislation, and addresses three topics: by-product status and criteria, end-of-waste status and the criteria, and the impacts of excluding from the concept of waste. The chapter discusses legal issues directly connected with the non-classification as waste of waste-based substances or objects and how the new regulatory framework for non-waste materials might promote or hinder the evolution of the circular economy and resource efficiency in waste treatment.

The fourth chapter discusses two very different waste streams and their material recovery in order to illustrate the problems involved in promoting material recovery through exclusions from the concept of waste. The fifth chapter analyses the regulatory situation in relation to energy recovery from waste using municipal solid waste and fuels derived from it as an example. The final chapter summarises the main points established in the dissertation and formulates theses that place these points within a wider framework encompassing both waste management and the circular economy.

1.4 THE WASTE FRAMEWORK DIRECTIVE

1.4.1 The Waste Framework Directive as a framework directive

The WFD is the main regulatory framework on waste in the EU. Its ‘framework’ status implies that it acts as *lex generalis* in relation to waste management and treatment. The WFD is generally applied when no sectoral legislation regulates differently on a specific waste stream or treatment technique.\(^{126}\) The current WFD was enacted to replace Directive 2006/12/EC,\(^{127}\) which was the codified version of Directive 75/442/EU.

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\(^{126}\) Van Calster 2015a, p. 1.


According to Article 1 of the WFD the WFD sets out measures to protect the environment and human health by preventing or reducing the adverse impacts of the generation and management of waste and by reducing the overall impacts of resource use and improving the efficiency of such use. In other words, the Directive applies to waste and all operations generating and managing waste. Article 2 lays down exclusions from the scope of the application of the Directive, for instance in respect of gaseous effluents emitted into the atmosphere or waste waters.

The WFD provides the basic elements of the legislative framework on waste and operation that manage or generate waste. It establishes the concept of waste, lays down the waste hierarchy for waste management and the basic requirements for all waste management from transportation and recovery to the disposal of waste. The concept of waste, in particular, has a huge impact on other legislation and ties substances and objects to the scope of application of the WFD.

The WFD is not a framework directive in name. However, it is referred to as such most of the time. The term ‘framework directive’ has been used fairly liberally. Boogard argues that the term should be reserved for flexible directives of a general character that to a large extent lay down open-ended standards and procedural rules on the implementation of these standards. In many ways the WFD follows this prescription as it allows national regulators and authorities a great deal of leeway in terms of implementation and interpretation. In addition to leaving leeway for national authorities, framework directives provide a framework for that guides the more specific regulatory targets set out in daughter directives. This creates coherence within EU waste legislation as a whole and successfully promotes subsidiarity, which is a key principle of EU law. However, the WFD also lays down specific and strict legal provisions of a kind fairly untypical of framework directives.

The combination of environmental protection as the main objective of the WFD together with its framework directive character is a popular combination in this legal sphere. The reason for this is that effective environmental protection often requires flexibility, so that the different circumstances – or, in the case of the WFD, the diversity between generated waste streams and the technical possibilities of utilisation – can

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130 In relation to some exclusions, such as that for waste waters, the WFD is not applied to the extent that the issue in question is covered by other legislation.
132 Ibid., p. 66.
be taken into account. This is why national implementation of the provisions and objectives laid down in the waste legislation is so important, as is the need to correctly interpret the definitions used in the legislative framework. Interpretative gaps in respect of the concept of waste might create barriers to the achievement of the circular economy.

1.4.2 Legal basis of the Waste Framework Directive

The legal basis of the WFD is Article 192(1) Treaty on the Functioning of the European Union (TFEU), which refers to action to be taken to achieve the objectives referred to in Article 191. These objectives include the preservation, protection and improvement of the quality of the environment and the protection of human health. The recital to the WFD argues that since most significant waste management operations are covered by legislation in the field of the environment, it is important that the WFD be adapted to that approach. Therefore, Article 192 TFEU is an appropriate legal basis. The emphasis on the environmental objectives set out in Articles 191 and 192 TFEU brings the environmental impacts of waste generation and waste management more sharply into focus throughout the life-cycle of resources. EU waste legislation has many different legal points of emphasis but it was not felt appropriate for it to have a dual legal basis.

The problem with the legal basis for environmental protection and waste treatment measures derives from the fact that as physical, and sometimes valuable, objects or substances, wastes are capable of being traded between Member States and with third countries. The international legislation on transboundary movement of waste lays down different rules for waste streams destined for disposal and waste stream destined for recovery operations. The nature of these transactions is quite different, when the supplier is often getting paid for shipping recoverable waste material to its end-user and the supplier often pays to get rid of waste destined for disposal. Regardless of the destination, the CJEU has ruled, in Commission v Belgium, that waste is subject to the provisions on the free movement of goods laid down in Article 34 TFEU. The judgment in this case was based on the argument that it is impossible to differentiate between recoverable and non-recoverable waste.

Despite free movement and marketing of waste, the CJEU has ruled that legislation governing waste is rightly based on the legal basis of environmental protection. In its reasoning the CJEU found that even though waste clearly had some linkage to

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136 See ‘Growth Within: A circular economy vision for a competitive Europe’, Ellen MacArthur Foundation 2015, p. 21, for the point that waste legislation often emphasises the environmental protection aspect in relation to waste management. An unnecessarily strict environmental approach can create administrative or legal barriers for recovery operations in respect of waste.

137 See e.g. C-203/96 Dusseldorp (1998) ECR I-4075.


other branches of law, the primary objective of the legislation was the protection of the environment. This view was further verified in European Parliament v Council.\textsuperscript{140} However, the Council has based other directives on waste on different legal bases. Considering the prior case-law, it would seem clear that the main objective of those directives is also environmental protection.\textsuperscript{141}

In Commission v Council, the Advocate General argued that the waste directives concerning waste streams for specific industrial purposes could be based on the objective of the functioning of the internal market instead of environmental protection taking into account their competitive elements.\textsuperscript{142} However, despite the opinion of the Advocate General the competence to enact waste legislation that aims to tackle the problems of waste on a general level should be based on Article 192 TFEU, which offers an environmental protection basis by reference to Article 191. Drawing a line between ‘specific’ and ‘general’ waste legislation provisions leaves an interpretative gap as to which legal basis to use in relation to the regulation of waste management. The more the environmental legal basis is used for this purpose, the more leeway Member States and national authorities gain in respect of waste management and waste treatment options.\textsuperscript{143}

The main objectives of the EU’s current waste policy are based on the circular economy action plan, which includes elements drawn from both economic and environmental legislation. Nevertheless, the action plan is deeply rooted in environmental protection: the reduction of waste generation, the substitution of waste materials for primary materials, and prolonging the life-cycle of products and materials. The mere fact that many waste streams have economic value does not change the objectives of waste legislation to internal market-driven objectives.


\textsuperscript{141} Krämer, Ludwig, EU Environmental Law, Sweet & Maxwell 2016, pp. 82–84.

\textsuperscript{142} Advocate General’s opinion in C-155/91 Commission v Council (1993) ECR I-939.

\textsuperscript{143} See Krämer 2016, pp. 83–84.
2 KEY CONCEPTS AND THEIR EVALUATION

2.1 THE WASTE HIERARCHY

2.1.1 Introduction

Article 4 of the WFD provides that the following waste hierarchy applies as a priority order in waste prevention and management legislation and policy: (a) prevention; (b) preparing for re-use; (c) recycling; (d) other recovery, e.g. energy recovery; and (e) disposal. This waste hierarchy consists of two levels: the first seeks to minimise the production of waste, and the second lays out the operational priority order for existing waste. Article 4(2) of the WFD states that when applying the waste hierarchy referred to in paragraph 1, Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams to depart from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste.

The key aspects of the arguments for the circular economy regarding waste and material circulation are embodied in the waste hierarchy. Therefore, complying with the objectives of the hierarchy involves complying with the objectives of the circular economy as far as waste and material cycles are concerned. Waste hierarchy shall be used as a measure in the assessment of the environmental effectiveness of the legal regime of the concept of waste and non-waste. Consequently, because the waste hierarchy lays down the legal mandate for circular economy objectives it is undeniably one of the key concepts discussed in this dissertation.

The waste hierarchy is a significant policy instrument that aims to ensure the availability of the best possible alternatives in respect of waste treatment. However, the waste hierarchy has also had a direct impact on waste management operations in practice. The attempt to draw a line between the levels of the hierarchy has given rise to multiple questions on its rationality and interpretation. The bottom line is that the hierarchy must be followed, unless Article 4(2) offers a reason to depart from it. These potential derogations are discussed in chapter 2.1.4.

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144 See Williams, I. D., ‘Forty years of the waste hierarchy’ (editorial), Waste Management 40 (1–2) 2015, p. 1: According to Williams most countries see the waste hierarchy more as a ladder where one starts from the bottom and climbs to the top step by step than as a priority order where implementation should start from the top and go to the lower levels only when necessary.


146 See Van Calster 2015a, p. 50.

147 See Scotford, Eloise, ‘The New Waste Directive – Trying to Do it All… An Early Assessment’, Environmental Law Review 2/2009, pp. 80–81, for the view that the broad policy objectives of the hierarchy were considered too wide to actually create a sustainable priority order for the management of different kinds of waste streams.
2.1.2 Obligations under the waste hierarchy

2.1.2.1 Subjects of the obligation

The direct addressees of the obligations set out in the waste hierarchy are Member States, which have to comply with the hierarchy in their waste policy and legislation. The hierarchy binds all public authorities in respect of their decision-making, and the hierarchy has to be taken into account, for example, in relation to environmental permits. The possibility of departing from the hierarchy adds a new dimension to the obligation because Member States can justify different approaches to waste management by reference to an environmental and life-cycle approach. Nevertheless, Member States are obliged to follow the hierarchy in drafting national waste policy and national waste management plans.\(^{148}\)

Article 4(2) of the WFD also states that Member States shall ensure that the development of waste legislation and policy is a fully transparent process, observing existing national rules about the consultation and involvement of citizens and stakeholders. Member States shall take into account the general environmental protection principles of precaution and sustainability, technical feasibility and economic viability, protection of resources as well as the overall environmental, human health, economic and social impacts, in accordance with Articles 1 and 13.\(^{149}\) The latter sentence mainly articulates the ideals behind the legislation and does not impose any obligations directly upon Member States. The first sentence, however, imposes an obligation on Member States to ensure that there is the possibility for public participation in waste management.

Article 4(3) that was added in the 2018 amendment of the WFD regulates that Member States shall make use of economic instruments and other measures to provide incentives for the application of the waste hierarchy, such as those indicated in Annex IVa or other appropriate instruments and measures. The new Annex IVa lists instruments such as charges and restrictions for the landfilling and incineration of waste which incentivise waste prevention and recycling, while keeping landfilling the least preferred waste management option and ‘pay-as-you-throw’ schemes that charge waste producers on the basis of the actual amount of waste generated and provide incentives for separation at source of recyclable waste and for reduction of mixed waste. The new provision laid down in Article 4(3) does not seem to provide very clear and precise new obligations but brings some concreteness into the hierarchy.

The private party obligations of the waste hierarchy result from the fact that it is implemented at national level. For example, in Finland implementation of the waste hierarchy\(^{150}\) involves the imposition of a binding obligation upon operators to comply with the waste hierarchy. However, this obligation has to be considered problematic

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\(^{148}\) See Peeters, Marjan & Uylenburg, Rosa, ‘Concluding observations: Three core themes’, in Peeters, Marjan & Uylenburg, Rosa (eds.), EU Environmental Legislation: Legal Perspectives on Regulatory Strategies, Edward Elgar 2014, p. 242, for the view that even with the possibility to depart from the hierarchy EU legislation requires a certain level of coherence in order to avoid conflicts between different regulatory approaches and uncertainty about the application of provisions. With the departures and the waste hierarchy, the latter seems to be the greater concern.

\(^{149}\) See van Ewijk, Stijn & Stegemann, Julia, ‘Limitations of the Waste Hierarchy for Achieving Absolute Reductions in Material Throughput’, Journal of Cleaner Production, Vol. 132, 2016, p. 126, for the view that although it is clear that the economic feasibility of the recovery operation has to be taken into account, it cannot completely bypass the rules of the hierarchy.

\(^{150}\) Finnish Waste Act 646/2011 (jätelaki).
due to its vague formulation and unclear scope of application. Private operators are obliged to use the waste hierarchy as the objective basis of all their operations. The possibilities of departing from the hierarchy are similar to those set out in Article 4(2) of the WFD.

The multilevel obligations of the waste hierarchy are imposed solely via national implementation measures. EU legislation has direct effect only when the obligations in question are precise, clear and unconditional and do not call for additional measures, either at national or EU level, to be put in place. On top of that, directives only have direct effect when their provisions are unconditional and sufficiently clear and precise and when the Member State has not implemented them by the deadline. Clearly these preconditions are not achieved in respect of the waste hierarchy. The obligation to achieve the objectives set out in the WFD is imposed on Member States, which have the freedom to implement it in their own way. Private party obligations cannot exist before the WFD is properly implemented within the deadline.

2.1.2.2 Practical content of the obligations
Prior to the present version, the waste hierarchy mainly encouraged Member States to act in accordance with it and prevent the production of waste and minimise its hazardous characteristics. The waste hierarchy currently in existence imposes more concrete obligations. However, these obligations should be considered ‘obligations of best effort’ rather than ‘obligations of results’. The key difference is that obligations of best effort allow Member States to use more excuses for failure to comply with the objectives at hand. Most of the time, it suffices for Member States to merely strive to achieve compliance with the hierarchy. In obligations of results, certain results are either achieved or the Member State is responsible for non-compliance with EU law.

Because the waste hierarchy mostly imposes obligations of best effort, it is emphasised in the contexts of waste management planning and waste prevention planning. It also has a significant role in determining waste management responsibilities: each Member State is supposed to allocate these responsibilities to producers and owners of waste in accordance with the hierarchy. In this way, the obligations imposed on Member States are transferred to actors in the field, such as waste management companies.

Pursuant to the principles of self-sufficiency and proximity laid down under Article 16 of the WFD, Member States are also required to establish an adequate

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151 C-26/62 Van Gend en Loos (1963) ECR 00001.
152 C-41/74 Van Duyn (1974) ECR 1337. See also C-152/84 Marshall (1986) ECR 723: the direct effect of a directive could only be pleaded against the state.
155 See Van Calster 2015a, p. 66.
156 See C-461/13 Weser, ECLI:EU:C:2015:433: the waste hierarchy cannot be interpreted as laying down concrete and detailed obligations comparable e.g. to those contained in the river basin protection plans.
network for recovery and disposal installations in accordance with the waste hierarchy for household waste. Member States should treat the waste in the nearest possible installation and do so self-sufficiently. However, the principles should not be applied to waste for recovery and in fact only impose obligations on Member States in respect of the last step in the hierarchy: disposal.

The waste hierarchy can have a significant effect on private operators through the practice concerning national and regional waste management plans and environmental permits. Because of this, when making an application for an environmental permit a private operator that wishes to depart from the priority order set out in the waste hierarchy has the burden of proof in respect of the life-cycle justification of best overall outcome as defined in Article 4(2). Providing the life-cycle assessment for departures is also an obligation imposed on Member States where they provide for a departure from the waste hierarchy, or on the operator that wishes to depart from it.

Obligations aimed at fulfilling the objectives of the waste hierarchy are mostly located in Articles 8 to 12 of the WFD. Certain obligations are imposed directly upon private operators pursuant to the extended producer responsibility provided for in Article 8. Although the waste hierarchy involves a low level of direct obligation, the possibility for departures from it and the life-cycle thinking framework around it create a clear framework for justifying different levels of waste recovery.

2.1.3 Priority order of the hierarchy

2.1.3.1 Waste prevention

Waste prevention is the preferred operation under the waste hierarchy. Although the circularity is often linked with more efficient waste recovery, the real main objective of circular economy is the more efficient material use. For this point of view waste prevention should be held as an exemplary case for circular economy.

Article 3(12) of the WFD defines prevention as defined measures taken before a substance, material or product has become waste that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products. The concept of waste prevention includes preventing the production of waste, especially at the source of production, and the assumption of re-use. If the substance or object requires further processing before re-use, the operation is not waste prevention but preparing for re-use or recycling. There is a non-exhaustive list of examples of waste

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161 Guidance on applying the Waste Hierarchy, DEFRA 2011, p. 9, which notes that in practice private party obligations may include that party making a plan as to how the waste hierarchy is to be applied, monitoring their performance regularly, knowing what waste they are producing, making efforts to produce less, and sorting and segregating the waste they do produce to help them or others recover value from it.

162 Jans & Vedder 2012, pp. 480–481.

prevention measures in Annexes IV and IVa to the WFD. 164 The list mainly contains measures that are quite general and broadly defined.

Waste prevention is the only step of waste hierarchy which is not considered a waste treatment operation since it is not directed towards waste. 165 Therefore, the WFD does not apply to waste prevention measures. 166 However considering the logical structure of the waste legislation, the current placing of the provisions on waste prevention seems reasonable. 167 For example the product standards contained in Directive 2011/65/EU (hereinafter the ‘RoHS Directive’) 168 on hazardous substances used in electrical and electronic equipment have worked as waste prevention measures by reducing the content of hazardous substances in the products and in this way reducing the adverse environmental and human health impacts of end-of-life electronic equipment. However, the most problematic part of the highest step is its immeasurability: while it may be easy to measure how much waste is recycled, it is more problematic to measure how much waste is not produced since that would involve measuring absence of something. 169

2.1.3.2 Preparing for re-use
Unlike waste prevention, preparing for re-use is a waste treatment operation. 170 It is also considered a recovery operation. Recovery operations refer to operations where waste is utilised for a beneficial purpose where it replaces other materials and in this way preserves virgin materials. 171 Article 3(16) of the WFD defines preparing for re-use as checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing. Re-use refers to a situation where products or components that are not waste are utilised for their original purpose of use.

The difference between re-use and preparing for re-use may be conceptualised as follows: in re-use the product is not waste, but in preparing for re-use the product is still considered as waste until the preparation is finished. Repairing a bicycle that

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164 COD 2015/0275: COM (2015) 595 final. Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste. Note from General Secretariat of the Council. Brussels 23 February 2018, pp. 48: The original Article 9 of the WFD was amended to include a definition of the characteristics of waste prevention operations. In the current version for example, a waste prevention operation ‘encourage(s) the design, manufacturing and use of products that are resource efficient, durable (including in terms of life span and absence of planned obsolescence), reparable, reusable and upgradable’.


166 See Malinauskaite & Jouhara & Spencer, 2017, p. 68, for the observation that the WFD does not contain a well-defined classification of waste and non-waste. It is not clear how the top level of the hierarchy operates in the WFD.


169 See Van Calster 2015a, p. 50.

170 See e.g. Krämer 2016, pp. 376–377.

would have been thrown away otherwise is a typical example of this. In the waste hierarchy re-use is included under waste prevention since it is about preventing the production of waste and not recovering the already-produced waste. In preparation for re-use the waste is recovered to its original use after the point it was waste. These measures can be rather widely interpreted and even checking the quality of a product has been considered as preparing for re-use. Van Calster argues that the measures need to involve a certain level of intensity to be considered preparing for re-use and not re-use. While the WFD does not apply to re-use operations, it does in fact apply to preparing for re-use operations.

2.1.3.3 Recycling

Recycling is also a recovery operation. Article 3(17) of the WFD defines recycling as any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations. The key aspect of recycling is that the physio-chemical characteristics of the waste matter are changed in such a way that it can be used again for the same or a different purpose. Processing the waste materials is crucial for the circular economy since many waste materials cannot be used without processing due to their hazardous properties and impurities. Recycling includes all kinds of physical, chemical and biological treatments that lead to the material ceasing to be waste.

The definition of recycling only covers material recovery operations. For example, even the most energy efficient waste-to-energy operation can never be considered recycling. Not even all material recovery operations qualify as recycling: backfilling operations are not considered recycling even though, adopting a wide interpretation, those kinds of operations, are considered material recovery operations. For example, sorting paper waste, pelletising plastic waste and melting glass cullet in order to manufacture new glass products can all be considered recycling operations.

Article 11 of the WFD regulates re-use and recycling, and provides that Member States shall take measures, as appropriate, to promote the re-use of products and preparing for re-use activities and they shall take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors. Separate collection of the waste streams suitable for re-use and recycling is recommended. Article 11(2) of the WFD sets the targets for recycling and re-use for Member States. The main difference
between recycling and preparing for re-use is that in re-use the materials are always used for their original purpose, whereas in recycling they can also be used for other purposes. Moreover, in recycling more drastic processing methods can be used and in preparing for re-use it is vital that the material will only undergo slight modification in order to be usable again.

2.1.3.4 Other recovery

The term ‘other recovery operation’ is not explicitly defined in the WFD but energy recovery is given as an example of it in the waste hierarchy. Therefore, it would seem that other recovery operations cover all waste treatment operations that are not disposal, preparing for re-use or recycling.\(^ {178}\) Besides energy production, other recovery operations include, for example, backfilling operations that are explicitly left out of the definition of recycling.\(^ {179}\) Article 3(15) of the WFD defines recovery as any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Usually this means that there is a high level of interchangeability between the waste product and its virgin counterpart. Annex II sets out a non-exhaustive list of recovery operations.

In relation to other recovery operations, the interpretation of the term ‘energy production operation’ has attracted the most discussion. It has proved somewhat difficult to draw a clear line between energy production as a recovery operation or as a disposal operation. The R1 formula set out in Annex II to the WFD represents the basic energy efficiency standard that is used to determine whether the incineration of municipal solid waste is a recovery or a disposal operation.\(^ {180}\) In addition to this, a recovery operation cannot be an integral part of a disposal operation.\(^ {181}\) This does not mean that waste-to-energy operations are disposal operations. Nevertheless, it emphasises the importance of efficiency and the performance standards for energy production in determining the step of the waste hierarchy at which a particular operation should be placed.\(^ {182}\) An energy-efficient waste-to-energy operation is a recovery operation just like preparing for re-use and recycling, only lower in the hierarchy.\(^ {183}\)

Burning waste in order to produce energy does not fit well in traditional definition of ‘circularity’ but maintains the idea of efficient material use emphasised in circular economy: If the material has already turned into waste and cannot be recovered in a

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\(^{178}\) As mentioned above, waste prevention is not a waste management operation.


\(^{183}\) See e.g. Krämer 2016, pp. 377–378.
new material purpose of use, it is better to take its remaining potential (energy) than to let it go completely to waste.

2.1.3.5 Disposal

Article 3(19) of the WFD defines ‘disposal operation’ as any operation which is not recovery, even where it has as a secondary consequence the reclamation of substances or energy.\(^{184}\) Annex I to the WFD sets out a non-exhaustive list of disposal operations. Drawing a distinction between other recovery operation and a disposal operation can be difficult from time to time: as mentioned above, this issue has been discussed especially in relation to waste-to-energy operations and their energy efficiency requirements.\(^{185}\) As the opposite of recovery operations, disposal operations are not beneficial most of the time. In disposal operations the level of interchangeability between a virgin product and waste should be low or non-existent. Landfilling of the waste is commonly considered a disposal operation, even when there is a possibility of benefiting from the landfill gases in energy production. However, landfill gas production is inefficient and has negative environmental impacts that energy production normally does not entail.

All waste treatment operations are either recovery or disposal operations, while all waste treatment operations that are not recovery operations are disposal operations. The bottom line is that only the waste that cannot be used in recovery operations – but all of that waste – should be directed to disposal operations. The Landfill Directive regulates disposal through landfills but there are many other methods of disposal. A large number of different disposal operations are regulated under various legal instruments to ensure the prevention of adverse environmental and human health effects.

Disposal operations do not fit to circular economy strategy very well. However, it has to be taken into account that there will always be situation where the waste, for reason or another, cannot be utilised in a recovery operation. In those situations, disposal operations are necessary to protect the environment and human health from the negative impacts of wastes. Disposal operations should also be preferred in the situation where the recovery of the waste would cause adverse environmental or human health impacts for example due to the contamination of the waste.

2.1.3.6 Temporary storage and landfill mining

Neither the waste hierarchy nor the EU’s waste policy indicate how to deal with the possibility of landfill mining, where waste that was once allocated to landfills is returned to recovery operations. Traditional landfilling is not necessarily viewed as a ‘final solution’ for waste any longer as some even refer to landfills as temporary storage sites where waste awaits further processing and recovery for a period of time. This idea is based on the notion that the current regime, which involves incinerating and dumping waste, reduces the possibility of material recovery and efficient re-use.

\(^{184}\) The disposal status of a waste treatment operation can be ruled through a contrario argument which is very typical in systematic interpretation in EU law.

and recycling of the waste. In landfill mining these ‘temporary storage’ facilities can be used as a means of reclaiming valuable materials from waste held in a landfill site.\textsuperscript{186}

The waste hierarchy laid down in Article 4(1) of the WFD aims to ensure that waste is removed from disposal operations and placed in different kinds of recovery operations in the priority order of the hierarchy. There is also a possibility to depart from the strict priority order set out in the hierarchy to achieve the best overall environmental outcome. The overall assumption is that when Member States follow the waste hierarchy priority order, life-cycle thinking forms part of the basic provision of the hierarchy.\textsuperscript{187}

According to the Commission’s guidance document on interpreting the WFD, in addition to dividing the waste treatment options in waste recovery or disposal, there is a third option: preparation prior to recovery or disposal.\textsuperscript{188} Temporary storage is neither recovery nor disposal, but a part of either operational category. The waste treatment stage is not explained in the WFD, but the guidance document refers to the ‘processing of waste which still results in a waste which subsequently undergoes other waste recovery steps’.\textsuperscript{189} These activities do not have a particular place in the waste hierarchy but can be considered as precursors to the specific types of recovery and disposal in existence.

De Römph takes the view that the term ‘storage’ can be divided into four different categories. The first of these is ‘temporary storage of waste pending its collection’. This type of storage is covered in entries D15 of Annex I to the WFD and R13 of Annex II and takes place at the waste generation site. In this case temporary storage falls into the category of preliminary storage and under the definition of collection in Article 3(10) of the WFD and therefore would not be considered a waste treatment operation.\textsuperscript{190} The second category is explained in recital 16 of the WFD, which states that preliminary storage of waste as a part of a collection process refers to a storage activity pending its collection in facilities where waste is unloaded in order to permit its preparation for further transport for recovery or disposal elsewhere. This option is also considered as collection and temporary storage.

The third option is ‘storage of waste pending treatment’ where the waste is stored at the facility where it undergoes disposal or recovery operations. The storage is considered waste treatment until the point where waste is stored either for more than three years pending recovery or for more than one year pending disposal. In the event of recovery the time limit can be extended in respect of exceptional cases.\textsuperscript{191} However, in both cases, after the time limit is passed, the holder is obliged either to

\textsuperscript{186} De Römph 2016, pp. 107–108.


\textsuperscript{190} De Römph 2016, p. 112. See Article 3(10) of the WFD.

\textsuperscript{191} This rule derives from Article 2(g) of the Landfill Directive. No examples of exceptions are provided in the WFD or in the guidance on the WFD.
use the waste in a recovery operation or to dispose of it. The last storage category is permanent storage, which is quite obviously considered a disposal operation.\(^{192}\)

The definitions contained in the present waste legislation do not extend to cover landfill mining, even though it would seem a good fit for the circular economy. Of the four different storage categories, De Römph argues that only storage prior to recovery could be adjusted to promote the objectives of the circular economy, through deletion of the three-year time limit after which the operation is regarded as a disposal operation. This kind of solution carries a risk of ‘fake storage’, which time limits were laid down in order to combat in the first place. Genuine temporary storage could be considered as an operation of ‘preparation prior to recovery’, which already exists in the WFD.\(^{193}\) Limiting the time and place of the waste treatment extensively can lead to inefficient execution of waste treatment. In addition, landfill mining would involve challenges, such as that of applying the waste hierarchy during the actual process in which waste is produced both for material and energy recovery purposes. Landfill mining also suffers from a lack of technical solutions that would enable the sorting and separation of different waste fractions.\(^{194}\) Landfill mining has the potential to widen the scope of circular economy also to wastes that have already been disposed in landfills.

2.1.4 Departures from the hierarchy

2.1.4.1 Introduction

Article 4(2) of the WFD states that when applying the waste hierarchy Member States shall take measures to encourage the options that deliver the best overall environmental outcome. Departures from the hierarchy must always focus on specific waste streams and, as with all exceptions, be interpreted narrowly. They must be justified by reference to the criteria set out in Article 4(2), which entails carrying out a form of environmental impact assessment. Decisions taken in accordance with the normal priority order do not need to be justified even when the options involved do not deliver the best overall environmental outcome.\(^{195}\) Departures, however, have to be separately justified in the administrative decisions and must be based on the characteristics of the waste stream and the effects on the environment and on human health caused by using it for a specific purpose. It may be troubling from an environmental standpoint that there are certain situations where decisions taken in accordance with the normal priority

\(^{192}\) De Römph 2016, p. 112.

\(^{193}\) De Römph 2016, p. 119. De Römph acknowledges the risk of fake storage and proposes that further research is needed as to how to address these situations in the legislation while promoting landfill mining.

\(^{194}\) For example, municipal solid waste may include materials fit for material recovery in small concentrations but the costs of waste separation before material recovery often make energy recovery the more attractive option.

order do not deliver the best options but do not have to be justified.196 Most of the
time the logic of the waste hierarchy, with no departures, holds. Therefore, there is
no need to refrain from the strict textual interpretation even from the point of view
of teleological approach.197

The departures are a reflection of the CJEU’s judgment to the effect that there
is no hierarchy between the re-use of packaging and the recovery of packaging
waste, pending life-cycle assessments ‘to justify a clear hierarchy between reusable,
recyclable and recoverable packaging’.198 Departures from the waste hierarchy help
with the problem of separating different waste streams and their life-cycles from
each other but come with their own problems. The varying technologies and waste
management capacities available in different Member States can also be taken into
account in relation to the departures.199 The reasons for departing from the hierarchy
may include, for example, technical feasibility, economic viability or environmental
protection.200 The departures aim for best possible solutions in circular economy by
offering room for discretion in the priority order for waste management.

2.1.4.2 Life-cycle assessment
Waste streams may depart from the waste hierarchy where this is justified by life-
cycle thinking on the overall impacts of the generation and management of such
waste. The main objective of life-cycle thinking is to achieve awareness of the overall
environmental impact of the product or service. This requires looking at the entire life-
cycle of the product, starting with the extraction of natural resources and including
all processing, manufacturing, marketing, distribution, use and treatment as a waste.
In relation to departures from the waste hierarchy life-cycle thinking aims to ensure
that certain environmental impacts are not generated when evaluating alternatives
and to avoid generating different kinds of environmental damage when one kind of
damage is prevented. This should provide a waste hierarchy that efficiently controls
the environmental impacts of waste treatment.201

Life-cycle thinking is an umbrella concept that covers a range of quantitative
decision-support mechanisms such as life-cycle assessment, cost-benefit analysis,
life-cycle costing, and social life-cycle assessment. These analyses can be utilised to
support decision-making with regard to departing from the waste hierarchy but there
is no legal obligation to apply any of these mechanisms. The Commission’s guidance
document indicates that the WFD life-cycle assessment is the most comprehensive
mechanism of those mentioned above to support the life-cycle thinking in

196 Schmidt, Jannick H. et al., Per, ‘Life cycle assessment of the waste hierarchy: A Danish case study on
waste paper’, Waste Management 27 (11) 2007, pp. 1528–1529, for the point that it would generally seem
that in the life-cycle assessment, material recycling bypass energy production and energy production are
all disposal operations.

197 See Lenaerts & Gutiérrez-Fons 2013, pp. 6–7, 25.


University Press 2013, pp. 703–704.

200 COM (2017) 34 final. Communication from the Commission to the European Parliament, the Council, the
European Economic and Social Committee and the Committee of the Regions – The role of waste-to-energy
in the circular economy, p. 4.

waste, pp. 49, 51.
environmental matters. The departures provided for in Article 4(2) of the WFD are clearly considered environmental matters, as life-cycle thinking should provide the tools to reach a decision on the best overall environmental outcome.202

The term ‘life-cycle assessment’ refers to an approach where the assets and liabilities both upstream and downstream of the product are considered. The life-cycle includes all the stages of production, starting from the extraction of the natural resources, spanning all processing stages, delivery and use, and extending all the way to the end where the product is treated appropriately in a waste treatment operation. This kind of comprehensive view also offers better grounds for evaluating resource efficiency in circular economy. In the waste hierarchy, life-cycle thinking involves endeavouring to combine the waste policy with material efficiency and environmental targets on a larger scale.203 This represents a means of encouraging the use of different approaches in waste management when they are, in fact, the environmentally better option.204

In a life-cycle assessment no single part of the life-cycle is given extra emphasis. The life-cycle can be divided into five parts: (1) extraction of the raw materials; (2) producing the product; (3) packaging and distribution of the product; (4) use and maintenance of the product; and (5) disposal or recovery of the product. For example, the life-cycle of paper products begins with the extraction of the raw material through forestry, followed by the production of pulp and paper, packaging and distribution, its use and the possible alternatives for processing after use, taking into account transportation and other necessary factors.205 The input and output of all the stages determine the overall environmental impacts.206 Comparison between the scenarios entails comparison between the overall impacts of each.207 This ensures that the operations are executed with the absolute minimum of negative environmental impacts.208

Life-cycle assessment can be divided into four phases: (1) the goal and scope definition phase; (2) the inventory analysis phase; (3) the impact assessment phase; and (4) the interpretation phase. The aim behind the first phase is to identify different aspects to take into account in this particular life-cycle assessment as the depth and the breadth of the assessment can differ considerably depending on its goal and subject.

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204 This makes sense because the WDF is based on Article 192(1) TFEU, in respect of which the basic objectives of regulatory action are environmental in nature.
207 Schmidt et al. 2007, p. 1523.
The second phase entails a life-cycle inventory analysis, comprising an inventory of input/output data in relation to the subject of the assessment. The third phase is the impact assessment, which provides information to help assess the results of the previous phase in order to better understand their environmental significance. The fourth phase of the assessment is the interpretation phase where results of the study are summarised in order to draw conclusions on the impacts of different options in the product’s life-cycle.209

One of the problems that affects life-cycle assessment in the waste hierarchy is that no EU-wide life-cycle assessment standard has been laid down.210 The national options for performing the assessment may differ on a case-by-case basis.211 When life-cycle thinking or assessment is applied in redefining the priority order of the waste hierarchy, the assessment is usually done by comparing various waste treatment options rather than covering the entire life-cycle of the materials. Therefore, the life-cycle thinking and assessment applied to waste management may be quite different from that applied to products.212 This distinction alters slightly if there are multiple waste treatment options that prolong the waste material’s life-cycle by putting it back into use through re-use and recycling operations. These situations usually produce the greatest overall environmental benefits compared to waste treatment options where the life-cycle of the waste ends after the recovery or disposal operation. Many by-products and end-of-waste products belong specifically to this category.213

The departures from the waste hierarchy on the basis of life-cycle thinking function well in view of the objectives of the circular economy.214 However, since the original waste hierarchy itself sets out a priority order in which longer life-cycles are promoted by default, the departures provided for in Article 4(2) should not be regarded as bringing about profound and all-encompassing change. The waste treatment options that best manage to ‘close the loop’ and prolong a product’s life-cycle are usually waste prevention, preparing for re-use and recycling operations. Life-cycle thinking and life-cycle assessment create an important link between waste recovery and recycling and the circular economy scheme. It is not rational to aim for the re-use or recycling of all materials but some form of threshold should exist to ensure the rationality of the recovery operations. The holistic environmental footprint and the social value of the recovered material should be considered. This kind of threshold for recovery may be identified through life-cycle thinking and material

211 Ekern 2015, p. 158.
213 The real benefits that accrue from this categorisation are debatable, since many EoW products and by-products already belong to the highest levels of waste hierarchy despite the life-cycle assessment. See European Commission: Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, p. 49, for the point that decisions in line with the hierarchy do not have to be justified through life-cycle thinking and environmental impacts.
flow analysis. Material flow analysis aims to ensure that the recovery operations are available in practice and that the material flow can be directed in an appropriate way. The material flow analysis should be done in relation to the life-cycle assessment as the material flow of the waste stream has a conclusive impact on the possibilities of recovery and the real impacts of the life-cycle of the product.215

2.1.4.3 Limits of the waste hierarchy
The European Parliament has emphasised the importance of examining the departures of the waste hierarchy and life-cycle assessment in tandem.216 Life-cycle thinking generates restrictions as to when departures from the waste hierarchy can happen. The starting-point is that recovery operations and waste prevention should be preferred to disposal operations if they do not cause severe impacts on the environment or on human health. In disposal operations the waste material does not serve a beneficial purpose, so there are not many positive impacts to consider in the life-cycle assessment.217 In some extreme cases the waste material should be destroyed to prevent these hazardous elements from spreading further into the environment: for example, materials that contain certain substances of very high concern or certain banned substances.218

The second important aspect to consider in connection with departures from the waste hierarchy is that the main objectives of the WFD are tied to waste prevention and minimisation of the negative effects of waste.219 In situations where the generation of waste can be prevented, this option should be preferred over recovery operations. In most cases, it is clear that if the generation of waste is prevented, its impacts are the smallest. However, cases where the products already in use are tremendously energy inefficient or have big environmental impacts in their consumer-use stage the life-cycle assessment might show that recovery would have a better overall environmental impact than continuing to use it.

The difference between preparing for re-use and recycling is quite small under the waste hierarchy. The main difference between the two is that preparing for re-use mean ‘light’ pre-processing before re-use, but recycling entails a heavier pre-processing method. For this reason, most of the times preparing for re-use operations prevail over recycling operations even in life-cycle assessments relating to the possible departure. However, it is not necessarily always so. Preparing for re-use often is more of a ‘closed loop’ where material can be used most efficiently, whereas recycling often uses lower quality and mixed waste streams to produce simpler products. For example, preparing a television for re-use could mean using the electronic parts in a new television, while recycling a television could mean melting the parts to produce new raw material for similar products.

216 Van Calster 2015a, p. 49.
217 See Williams, Paul T.: Waste Treatment and Disposal, John Wiley and Sons Ltd, 2005, p. 185. However, the landfills have developed greatly in recent times.
Waste-to-energy production is on the second lowest step of the hierarchy and is therefore only considered to be a better operation than disposal (which is on the lowest step). Waste-to-energy operations are either R1 operations, where they are used principally as a fuel or other means to generate energy; or D10 operations, where the waste is incinerated on land with no energy recovery purpose. The main distinction between R1 and D10 is that if the D10 operation produces energy at all, the production should be so inefficient that it cannot be considered the main function of the operation. Material recovery is prioritised over energy recovery in the waste hierarchy. Sometimes these operations can use the same raw materials and that can be a serious problem especially for energy production since it relies on the uninterrupted supply of fuel.

If the waste is used in energy production, the option of material recovery is obviously no longer available except in the case of co-production of biogas and waste-based fertiliser products. Nevertheless, material recovery operations are not without their own energy demand. From the perspective of life-cycle thinking, it must be acknowledged that the material recovery uses less energy than using virgin raw materials in production process, so in many cases the energy demand involved in material recovery may be viewed in a positive light.

The system of departures allows Member States to take into account their waste management capacity and industrial structures. For example, in the UK exclusions from the hierarchy have been legally justified for certain waste streams. First, for food waste, wet or dry anaerobic digestion has been deemed better than other recycling and recovery options. Second, for garden waste, dry anaerobic digestion is better than other recycling and recovery options according to the life-cycle assessment. Third, for lower grade wood energy recovery options appear to be more suitable than recycling. These departures tell us that the waste hierarchy does not always offer the best waste treatment alternative in terms of environmental impacts.

2.2 RECOVERY AND DISPOSAL OPERATIONS

2.2.1 The legal definitions

In EU waste legislation all waste treatment operations are considered either recovery operations or disposal operations. Placing a waste treatment operation into one of these two categories has a decisive impact on the legislative framework governing

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220 Annex II to the WFD contains a non-exhaustive list of possible recovery operations.

221 Annex I to the WFD contains a non-exhaustive list of possible disposal operations.

222 The sufficient level of efficiency is discussed in chapter 5.


installations using waste. Both the operation categories are defined in Article 3 of the WFD. Article 3(15) defines recovery as ‘any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy’. Article 3(19) defines disposal operations as ‘any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy’. The main difference between the two categories is that in recovery operations the waste serves a useful purpose and fulfils a beneficial function whereas in disposal operations the waste serves no useful purpose.

The definition of recovery is based on the CJEU’s case-law, especially Abfall,227 and the opinions of Advocate General Jacobs in Euro Tombesi228 and Inter-Environnement.229 The important factor regarding the modern formulation of the definition of recovery operation is that the substitution of raw materials with waste-based materials no longer has to take place solely within a waste treatment installation. Recovery operations are completed when there are no waste-related risks and the resulting product complies with the protection of human health and environment obligations set out in Article 13 of the WFD.230 Article 12 provides that the protection of human health and the environment has to be taken into account in a similar way in disposal operations. With regard to the waste hierarchy, all stages but the top (waste prevention) and the bottom (disposal) are considered recovery operations. From the circular economy point of view, recovery operations offer increased efficiency for the use of the material. There are clear traces of the teleology in the distinction between the two concepts as the concept of recovery stems from the usefulness of the purpose of use of the waste. The usefulness of purpose cannot be assessed in the light of textualism as it is not defined in any legal provision but shall receive its legal content from argumentation deriving from effet utile (or effectiveness) of the interpretation.231 The interpretation of the concept of disposal however is less ambiguous and in many situations it can be interpreted through mere textual approach.232

It is crucial for installations using waste-based materials that their operation is considered a recovery operation and not a disposal operation because the classification defines the operation’s position in the waste hierarchy. However, more practical reasons also come into play: for example, if the operation is considered a ‘disposal operation’, the waste cannot cease to be waste as a result of the waste treatment. This applies regardless of the impacts of the process on the environment or on human health. The definitions of recovery and disposal operations are also significant in

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229 Advocate General’s opinion in C-129/96 Inter Environnement (1997) ECR I-7411.
230 Van Calster 2015a, p. 51.
231 In this kind of interpretation the systematic and teleological argumentation go hand-in-hand. See Lenaerts & Gutiérrez-Fons 2013, p. 25; Bengoetxea 1993.
232 However, in producing energy from waste, the line between recovery and disposal operations is unprecise and the concept of disposal operations extends beyond absolutely no energy production.
relation to transboundary movements of waste. The trend in CJEU case-law seems

to be to rely more on case-by-case factual analysis and less on the abstract concepts
associated with waste treatment to be found in the WFD. This can be seen in relation
to interpreting the concepts of recovery and disposal operations and the concept of
waste within the EU’s regulatory framework.

The amended WFD recognises a new concept of ‘material recovery’ in Article
3(15a) that refers to any recovery operation, other than energy recovery and the
reprocessing into materials that are to be used as fuels or other means to generate
energy. It includes, inter alia, preparing for re-use, recycling and backfilling. Essentially
it aims to distinguish material and energy recovery from each other.

2.2.2 Substitutability as a measurement of recovery

Article 3(15) of the WFD states that in recovery the waste should serve a useful purpose
when replacing other materials or fulfilling a function in the waste treatment plant or
in the wider economy. Serving a wider purpose in the economy essentially refers to
enabling energy efficient waste incineration to be considered a recovery operation.

A waste treatment operation that is considered to be preparing for re-use, recycling or
other recovery as in the waste hierarchy set out in Article 4 of the WFD automatically
falls under the overarching umbrella concept of a recovery operation. Perhaps the
most problematic cases are those that deal with ‘other recovery’ operations where
the concepts of preparing for re-use or recycling do not quite apply. Energy recovery
from waste that is efficient enough to be classified as an R1 operation instead of a
D10 operation and backfilling of waste are two examples of this. In Article 3(17a)
of the amended WFD defines backfilling as any recovery operation where suitable
non-hazardous waste is used for purposes of reclamation in excavated areas or for
engineering purposes in landscaping. Waste used for backfilling must substitute
non-waste materials, be suitable for the aforementioned purposes, and be limited to
the amount strictly necessary to achieve those purposes. The substitution aspect is
explicitly emphasised in terms of the backfilling operation qualifying as a recovery
operation.

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233 The subject is examined in chapter 3.6.4.
234 Van Calster 2015a, pp. 60–61.
235 See European Commission: Definition of waste recovery and disposal operations. Part A – Recovery
and disposal operations. Hamburg 2004, pp. 37–39, for the point that the recovery operation can include
reprocessing, production process, original purpose and other purposes. C-444/00 Mayer Parry (2003) ECR-
6163.
236 See Van Calster 2015a, p. 51.
237 The dividing line between these two categories is discussed further in the next chapter.
waste, pp. 33–34. More on the backfilling as recovery operation in European Commission: Guidance on
the interpretation of the term backfilling. Available at http://ec.europa.eu/eurostat/documents/3423664953052/
Guidance-on-Backfilling.pdf/c18d330c-9712-4f8c-badd-ba4649b47e or http://ow.ly/Mh7N301vKb5. See
also Turunen, Topi & Van Calster, Geert, ‘Burning Construction and Demolition Waste: An Assessment of
special issue, pp. 1–9.
A waste treatment operation is a recovery operation in two cases: (1) if it substitutes a virgin material and fulfils its function; or (2) if the waste fulfils another useful purpose in the waste treatment facility or basically anywhere else.\(^{239}\) Annex II to the WFD sets out a non-exhaustive list of recovery operations that indicate what kinds of waste treatment options may be regarded as recovery operations. Operations such as recycling/reclamation of organic substances which are not used as solvents (including composting and other biological transformation processes) (R3), recycling/reclamation of metals and metal compounds (R4) and oil re-refining or other re-uses of oil (R9) can be regarded as belonging to category (1) of recovery operations. There is no uniform threshold in terms of the burden of proof and degree of accuracy required in relation to qualifying as a recovery operation. For example, some wastes may cease to be waste after visual inspection whereas the energy efficiency with which energy must be produced from waste in order for this to be considered a recovery operation is strictly regulated under the WFD.

Many recovery operations entail clear substitutability between a virgin raw material and waste material. All current EU-wide end-of-waste criteria cover waste streams in this way: scrap aluminium, steel and copper as well as glass cullet are all products that substitute their virgin raw material counterparts as raw materials of industrial production.\(^{240}\) In these cases the waste material directly substitutes similar virgin materials in similar production processes. Hence, it is generally clear that the processes should be considered recovery operations if the waste directly replaces virgin raw materials. All preparing for re-use operations and most recycling operations are recovery operations where the substitution between the waste and virgin material is clear and direct.\(^{241}\)

Direct substitutability between raw materials and waste-based materials is not necessary in recovery operations. According to the definition set out in Article 3(15), recovery status also applies to waste materials that no longer involve waste-related risks and are ready to be used as raw materials in a process.\(^{242}\) The definition of recovery operation acknowledges efficient waste-to-energy facilities as recovery operations: in many cases the waste itself does not substitute fuel products such as natural gases or coal but is used in different kinds of incinerators in order to produce energy. Within the wider economy, the waste serves a useful purpose in producing energy and reducing the need for fuels although it does not necessarily directly substitute virgin fuels in the power plant. The main rule is that the waste should serve a useful purpose that would otherwise be served by virgin raw materials: in all situations, recovery operations should reduce the need for virgin raw materials. These kinds of operations are included in category (2) of the recovery operations: for example, the use of the


\(^{241}\) The definition set out in Article 3 of the WFD indicates that preparing for re-use returns the waste-based material to the same production process it was derived from. In recycling operations, the waste-based materials can, after more intense reprocessing, be returned to the same or a different purpose of use.

waste principally as a fuel or other means to generate energy (R1) or land treatment resulting in benefit to agriculture or ecological improvement (R10).

Compost is another example of a waste-based product that does not directly substitute any virgin raw material. Compost can be used as a fertiliser and growing media. However, most fertilisers and growing media are not similar to compost and it can therefore be argued that compost is not directly substituting them. As fertiliser, compost is subject to the same regulatory framework as other fertilisers but cannot be considered a direct substitute due to dissimilarities in terms of the physical and chemical construction of the substance. In this context, it is understandable that the requirements in terms of substitution are not as strict as for direct substitution. The distinction between recovery operations and ‘normal’ processing of raw materials is somewhat unclear.\textsuperscript{243} There is a danger of circular argumentation in relation to the notion that recovery operations can only apply to waste and that the operations to which the waste is subjected are always waste treatment operations (recovery or disposal).

2.3 WASTE

2.3.1 Five certainties of waste

The concept and the definition of waste has always been a key concept of waste legislation in international, EU and national law. Theorising the concept of waste would therefore be a remarkable achievement considering that the applicable waste legislation exists on different levels and with differing degrees of legal certainty in respect of different waste treatment operations. Gillespie has listed certain characteristics that are typical of waste substances in international law. He calls this list ‘the five certainties of waste’ and they are as follows:

1. Waste is unwanted solid material of no further use.
2. The costs of waste disposal have a significant effect on waste management.
3. As do international regulation and trade rules.
4. Waste is wasteful and creates costs.
5. Even though clear goals to reduce waste production exist, the exact opposite is happening.\textsuperscript{244}

The five certainties of waste are mostly relative certainties that can function as guidelines that offer a good overall grasp of what is meant by the concept of ‘waste’. Gillespie emphasises that, besides solid material, waste can also be liquid material and wastes can cease to be waste when they are taken back into use in different kinds of recovery operations. The latter is also true in current EU waste legislation. However, certain

\textsuperscript{243} Malinauskaite, Jouhara & Spencer 2017, p. 70.
\textsuperscript{244} Gillespie 2015, pp. 8–70.
aspects of EU waste legislation can apply to different kinds of gases. Nevertheless, gases are mostly considered emissions and not wastes.

The second certainty has been a significant driver for the development of new kinds of waste management innovation from both a legal and a technical perspective. The more waste is produced, the more effects the various wastes produce and the more solutions are required for new kinds of environmental problem that result. In addition to this, the prices of virgin raw material have increased and producing waste-based substitutes reduces both the need for raw materials and disposal operations and their environmental consequences. International regulation and trade rules have also functioned as incentives for developing waste treatment processes. Standardised trade rules also help international trade and drive more efficient waste recovery in industrial processes. The costs of waste disposal are constantly increasing, which has created a situation where over the half the operators in the industrial field want to benefit from recovered waste materials in their operations. Hence the private sector plays a crucial role in the circular economy. Nevertheless, to date neither the increased costs of waste treatment nor tightening the obligations imposed under the applicable waste legislation have reduced the volume of waste generated.

2.3.2 Case-law on waste

The case-law on the concept of waste is one of the largest in the history of the CJEU. This has had a clear impact on the EU’s current waste legislation. In early case-law on the subject, the CJEU took the view that the concept of waste should be interpreted widely, taking account of account the legal basis of the EU’s waste legislation and the purpose of the legislation. This meant that products with economic value are not excluded from the concept of waste. On the flipside, the CJEU also ruled that the negative economic value of waste products did not exclude them from the provisions

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245 I refer here to producer gases made from solid or liquid wastes as referred to in Article 42 of the IED. These gases are discussed later in chapter 5.3.2.

246 Gillespie 2015, pp. 8–10.


governing the free movement of goods contained in the primary law of the EU. The CJEU has clearly ruled that the economic value of the waste has no direct effect on its classification. In its case-law on the concept of waste, the CJEU clearly was guilty of judicial activism as its case-law clearly went over the textual analysis of the concept of waste laid down in the waste legislation to interpretations that could even be considered contra legem. Nevertheless, as will be specified later, the contra legem interpretations found their way into the definitions of the current EU waste regulation.

In Vessosso and Zanetti the CJEU ruled that the concept of waste is not to be understood as excluding substances and objects that are capable of economic re-utilisation. A substance discarded by a holder may still constitute waste even when it can be re-utilised. The national legislature stating otherwise was deemed incompatible with the EU waste legislation and it seemed that the possibility of re-use was not a sufficient basis on which to exclude substances from the widely interpreted concept of waste. In Euro Tombesi the CJEU elaborated on this ruling by adding that substances available for re-utilisation could still constitute waste even if the materials in question were the subject of a transaction or quoted on public or private commercial lists.

After the negative indications contained in the CJEU’s early decisions on the concept of waste, it heard numerous cases on the limits of the previously widely interpreted concept of waste. In Inter-Environnement the CJEU ruled that a substance is not excluded from the concept of waste by the mere fact that it directly or indirectly forms an integral part of an industrial production process and is thus re-usable in the same production process. Advocate General Jacobs stated that the waste status and the question of whether a substance was a threat to public health or the environment should be based on an objective assessment rather than a subjective assessment. He suggested that a residual (waste-based) product would not be considered waste if it was destined for direct use in a further process in its existing form; in other words, if it was not destined for disposal and did not require preparation operations prior to its re-use. Certain parts of Advocate General Jacobs’ opinions in this and in other cases have been implemented in the present waste legislation but the concept of waste is still deeply rooted in the intention of the holder.

ARCO Chemie had a huge impact on the interpreting the situation where waste may cease to be waste in the present legislation. In the case the operator wanted to

251 See Siltala, Raimo, Oikeudellinen tulkintateoria, Suomalainen Lakimiesyhdistys, 2004, p. 387, for the point that contra legem refers to a situation where interpretation is contradictory to the written versions of the law. Cf. Airaksinen, Jussi, ‘Petolinnun pesäpuun ympäristön rauhoittaminen turvetuotannon ympäristökuvauksen yhteydessä – KHO 2015:3’, Lakimies 5/2015, p. 724, footnote 19, for the point that contra legem could also refer to interpretation that is contradictory to the reconstructed ratio legis.
254 The CJEU has taken the view that the concept of waste should not be interpreted in a restrictive manner. See C-418–419/97 ARCO Chemie (2000) ECR I-4475, paras. 36 et seq.; C-252/05 Thames Water Utilities Limited (2007) ECR I-3883, para. 28; C-188/07 Commune de Mesquer v Total France SA and Total International Ltd (2008) ECR I-4501, paras. 39, 44.
export ‘LUWA-bottoms’, which constituted a by-product of its own production, to be used as a fuel in the cement industry. The waste status of the LUWA-bottoms determined whether Regulation (EC) No 1013/2006, which governs the shipment of waste, applied. The CJEU ruled that whether LUWA-bottoms are, in fact, waste must be determined in the light of all the circumstances. The fact that a substance used as fuel is the residue of the manufacturing process of another substance, that no use for that substance other than disposal can be envisaged, that the composition of the substance is not suitable for the use made of it or that special environmental precautions must be taken when it is used may be regarded as evidence that the holder has discarded that substance or intends or is required to discard it, and it is therefore considered waste. However, the CJEU emphasised that these elements leading to the concept of waste are mere indications and do not, in themselves, necessarily force the conclusion that a given substance is ‘waste’. The fact that a material is a result of a recovery operation is only one of the factors that must be taken into consideration when determining whether something is waste.

The judgment in *Palin Granit* also discussed the status of residual products and the definition of waste. The CJEU ruled that leftover stone (residue from stone quarrying) was to be considered waste because its holder stored it for an indefinite length of time to await possible use. Because further use could not be ensured, the stone was regarded as waste despite the fact that it did not pose any real risk to human health or the environment. The time limit after which the waste could be still used in recovery operations is set at the three-year mark. In *Commission v Spain* the CJEU clarified the blurred lines affecting material excluded from the scope of application of the concept of waste and the EU’s waste legislation. The CJEU assessed the waste status of livestock effluent (manure and slurry) and animal carcasses. The manure was not considered waste when it was used as soil fertiliser as part of a lawful practice of spreading on clearly identified parcels and when storage was limited to the needs of those spreading operations. This takes into account the ruling made in *Saetti* that it is possible for a substance not to be regarded as waste if it is certain to be used to meet the needs of economic operators other than those that produced it. As for the animal carcasses, such carcasses could not, as a general rule, be re-used for the purposes of human consumption due to the Community legislation laying down the veterinary rules for the disposal and processing of animal waste. The legislation specially drafted for carcasses of animals that die on the farm obliges the holder to dispose of them and thus makes it impossible for them to cease to be waste.

*Mayer Parry* concerned a scrap metal recycling company that sorted, cleaned and shred metal packaging waste and then sold it to steelmakers. The CJEU took the view...

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260 These criteria are clearly referenced in relation to the end-of-waste criteria set out in Article 6 of the WFD. The same logic was also applied in C-9/00 Palin Granit (2002) ECR 3533, para. 40; C-114/01 AvestaPolarit Chrome Oy (2003) ECR I-8725, paras. 36–42.


that recycling meant that the reprocessing of waste must enable the production of a new material or product possessing characteristics comparable to those of the material from which the waste was derived or obtained. It ruled that the recycling process was only completed when the steelmakers turned the scrap metal into new metal sheets that could be used again in the industry. The material could only cease to be waste after it was ready to be used again in similar operations. The same questions were addressed in *AvestaPolarit Chrome*, where the CJEU ruled that the holder of leftover rock and residual sand from ore-dressing operations discards or intends to discard those substances, which must consequently be classified as waste unless he or she uses them lawfully for the necessary filling of the galleries of that mine and provides sufficient guarantees for the identification and actual use of the substances to be used for that purpose.

The series of joined *Commission v Italy* cases followed and further developed the logic of the earlier CJEU case-law on materials excluded from the application of the concept of waste and the EU waste legislation. The CJEU decided that the Italian exclusions from the waste concept, with more than just one waste stream, misconstrued the broad interpretation of ‘waste’ given in the earlier case-law. Italy failed to take into account, in particular, the decisions in *Palin Granit* and *AvestaPolarit* when dealing with possible by-products. The CJEU emphasised that by-product status must be confined to situations where the use of goods, materials, or raw materials is not only a possibility but a certainty and where the use does not require further processing and forms an integral part of the production process.

*Saetti* confirmed once again the need for situational sensitivity when applying the concept of waste. In the case an oil refinery used petroleum cokes from a refinery of crude oil to produce energy. The plant used most of the energy itself and the surplus energy was sold to other companies and the grid operator. The CJEU emphasised that the petroleum coke was produced intentionally or in the course of producing other petroleum fuels in an oil refinery and was certain to be re-used as fuel to meet the energy needs of the refinery and other industries. Taking this into account the petroleum coke was not considered waste.

In *Niselli* the CJEU once again intervened in Italian national legislation on the concept of waste. It ruled that the definition of ‘waste’ cannot be understood as exclusively covering substances or objects intended for, or subjected to, the disposal or recovery operations mentioned in annexes to the current EU waste legislation or in equivalent lists, or to which their holder intends or is required to subject them. The concept of waste is not to be interpreted as excluding all production or consumption residues that can be or are re-used in a production cycle, either without prior treatment and without causing harm to the environment, or after undergoing prior treatment without, however, requiring a recovery operation listed in the Annex C to Legislative

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263 The reasoning used in *Mayer Parry* has been codified in the form of the end-of-waste criteria set out in Article 6 of the WFD.


Decree (No 22/97) in force in Italy at that time. In essence, the ruling in *Niselli* was that some prior treatment measures are permitted before the re-use of material.\(^{268}\)

In *Thames Water Utilities Limited* the CJEU held that the fact that the escape of waste water from the sewage system was accidental did not prevent the water from having been ‘discarded’ and therefore from being considered ‘waste’. The CJEU referred to the environmental legal basis of the current waste legislation and emphasised that the term ‘discard’ was not to be interpreted restrictively.\(^{269}\) The decision was in line with the earlier *Van de Walle* decision, in which an accidental spillage was considered ‘discarding’.\(^{270}\) A similar ruling was made in *Commune de Mesquer v Total*. The CJEU held that oil accidentally spilled at sea following a shipwreck was waste. This was so even when the hydrocarbons being transported were not waste prior to the shipwreck and spillage. The CJEU referred to its earlier case-law and, referring to its decision in *Inter-Environnement*, noted that the meaning of the term ‘waste’ depends on the meaning of the term ‘discard’.\(^{271}\) The bottom line was that the CJEU found that because the transported oil was not intended to be discarded and was being exploited commercially it could not have been waste during the transportation. The waste status derived from the spillage, which was considered as ‘discarding’ despite its accidental characteristics.\(^{272}\)

In *Shell* it was held that if the operator cannot use the off-specification materials supplied, these must be considered as waste since their holder has no use for them. The CJEU ruled that the redundancy of the material alone was not enough to justify its classification as waste. The decisive issue in respect of the status of off-specification material was whether the operator has returned the product to the supplier and obtained compensation in accordance with the sales contract, and at no point was planning to discard it.\(^{273}\) The CJEU took the view that since the supplier took the material back in order to mix it with another product and to release it onto the market, it was not classifiable as waste. It was clear that the material was not in itself waste in legal terms and the question was whether its redundancy to the operator was a sufficient ground for it to have waste status under the definition of waste set out in Article 3(1) of the WFD.\(^{274}\)

In *Lapin luonnonsuojelupiiri* the CJEU weighed the possibility of hazardous wastes ceasing to be waste through the application of the end-of-waste criteria set out in Article 6 of the WFD. The CJEU stated that using telecommunication poles as an underlay for duckboards was possible only if they were no longer waste under the conditions laid down in the first subparagraph of Article 6(1) of the WFD, particularly if their use does not lead to overall adverse environmental or human health impacts. The CJEU took the view that the criteria set out in Article 6 cannot, in themselves, make it possible directly to establish that certain waste must no longer be regarded


\(^{272}\) C-188/07 *Commune de Mesquer v Total France SA and Total International Ltd* (2008) ECR I-4501.


as such. However, when there are no EU-wide criteria Member States can decide on a case-by-case basis whether certain waste has ceased to be waste, taking into account the applicable case-law. The CJEU’s ruling in this case was perhaps too cautious. The criteria laid down in Article 6 of the WFD are based on the very same case-law that should be applied where it is necessary to decide on a case-by-case basis as to whether something has ceased to be waste, instead of just applying the criteria directly. Perhaps this choice was made in order not to create too specific a burden of proof for those applying for end-of-waste status but I for one cannot think of a situation where applying the criteria set out in Article 6 of the WFD would lead to a different outcome than applying the ‘applicable case-law’.

The CJEU also pointed out that there is no prohibition on hazardous waste ceasing to be waste. It stated that even hazardous waste can cease to be waste when it is usable without endangering human health or harming the environment and, also, if it is not found that the holder of the substance or object discards it or intends or is required to discard it. The materials could cease to be waste if their environmental and human health impacts could be sufficiently controlled way after waste legislation stops applying to them. In Lapin luonnonsuojelupiiri the CJEU stated that the main objective of Regulation 1907/2006/EC (hereinafter ‘REACH’) is to ensure a high level of protection of the environment and of human health. When a substance and its treatment are regulated in REACH, a higher standard cannot be set at national level. REACH was considered to control the effects of using a waste-based substance sufficiently, so that its ceasing to be waste did not cause any adverse environmental effects.

In Lapin luonnonsuojelupiiri the CJEU concluded that the chemical risks posed by CCA-treated (chromated copper arsenate) wood could sufficiently be controlled through restriction provisions contained in REACH. As the intended use of the old telecommunication poles was allowed under the specific restrictions relating to arsenic compounds contained in REACH, such CCA-treated wood could, according to the CJEU, have ceased to be waste. The main aim of REACH is to ensure the assessment of a substance’s potential adverse effects through laboratory and animal testing and to provide for the preparation of use-specific guidance on the safe use of the substance based on the data obtained through such testing. Furthermore, the registration procedure may be regarded as a means of providing information on ‘relevant product, environmental and health protection requirements for the specific use’ as required for by-product status under Article 5 of the WFD and in conformity with the ‘technical requirements for the specific purposes’ and ‘existing legislation and standards applicable to products’ contained in the EoW criteria set out in Article 6 of the WFD. The registration data may also be used to determine whether the non-

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275 C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142.
276 C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142.
278 C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142.
waste status of the substance or object is environmentally acceptable as required to satisfy both the definition of by-product and of EoW.279

The ever-changing concept of ‘waste’ has two different dimensions: on the one hand, it should be interpreted widely enough for it to cover the basic function of the waste legislation; but on the other hand that interpretation must be sufficiently clear that it creates legal predictability for operators that use waste in their processes. The EU’s waste legislation lacked this predictability before the CJEU built up a body of case-law in this field and numerous issues continue to arise between the thrust of the case-law and the content of the waste legislation. Before the WFD came into force, interpretation of the waste legislation had largely depended on the case-law. The history of this case-law can be divided into two phases: in the first phase the concept of waste was interpreted very widely with no exceptions in relation to different kinds of residues and so on; and in the second the possibilities for declassification as waste were confirmed. After this, the entry into force of the WFD ushered in an era of codification, during which the criteria for non-classification of materials as waste were laid down in the legislation. This does not mean that problems in relation to the interpretation of the EU’s waste legislation are a thing of the past, but it does mean that there is an overall framework and basic rules for the assessment of waste status and a legal basis for secondary legislation on the concept of waste and exclusions from it.

2.3.3 The concept of waste in current EU legislation

The current definition of waste is similar to that contained in the earlier legislative framework. Article 3(1) of the WFD defines ‘waste’ to mean any substance or object which the holder discards or intends or is required to discard.280 The term ‘discard’ is not limited to disposal operations in respect of waste. Substances or objects that are destined for recovery are also initially discarded and they are considered waste.281 The discarding of a waste can be intentional or unintentional 282 and voluntary or involuntary or can even happen without the knowledge of the holder.283 In relation to temporary storage of waste, the location at which a material is stored does not influence its waste status.284


280 See Steenmans, Katrien & Marriott, Jane & Malcolm, Rosalind, Commodification of waste: Legal and theoretical approaches to industrial symbiosis as part of a circular economy, University of Oslo Faculty of Law Legal Studies Research Paper Series No. 2017–26, pp. 7–8, for the opinion that “the current definition of waste and the relevant case law have three effects (1) what can and cannot be controlled is unclear; (2) when a material or substance becomes regarded as waste lacks clarity; and (3) it is questionable whether the current approach actually protects the environment, which is one of the objectives of the WFD”.


283 Case C-1/03 van de Walle (2004) paras. 46 et seq.

Inclusion in the EU’s list of wastes set out in Decision 2000/532/EC285 (hereinafter the ‘List of Wastes Decision’) does not necessarily mean that the substance or object is considered a waste. The Commission’s guidance document on the WFD gives a few examples of the three different ways in which a material may be considered as waste. It is clear that the substance or object is being discarded when (1) it is thrown into a waste bin,286 and (2) it is transferred to a waste collector. The intention to discard the substance or object is indicated when (1) it seems that it will be sent off-site for appropriate disposal or recovery or when any of its stock of raw materials cannot be recovered are considered waste, and (2) when leftover material which has been stored for an indefinite length of time to await possible use is discarded or intended to be discarded.287

In Commission v Italy the CJEU held that ‘[s]ince the directive does not provide any single decisive criterion for discerning whether the holder intends to discard a given substance or object, Member States are free, in the absence of Community provisions, to choose the modes of proof of the various matters defined in the directives which they are transposing, provided that the effectiveness of Community law is not thereby undermined’288 In the UK this has been interpreted in such a way that the national end-of-waste quality protocol can be considered as such modes of proof taking into account the CJEU’s case-law.289

The requirement to discard is fairly easy to understand: all substances and objects that must, according to the law, be discarded are considered waste. The Commission’s guidance document mentions banned pesticides and oils containing high concentrations of PCBs (polychlorinated biphenyl).290 Although both the subjects of recovery and disposal operations can be considered waste pursuant to Article 3(1) of the WFD, it is important to distinguish these two different operational categories. The concept of waste in the current regulation should be interpreted according to its wording. The history of the case-law behind the current formulation of what is considered waste and what is not, is implemented in the WFD, so there is no need to extend the interpretation of the concept as had been done in the case-law. The distinction between waste and non-waste is codified in the legislation and the concept of waste can mostly be interpreted through the textual approach.

286 See Steenmans et al, p. 9, for the point that in many cases the discarding of waste is connected to the transfer of its ownership.
287 Case C-9/00 Palin Granit (2002) ECR I-3533, para. 39. For closer analysis, see de Sadeleer JEEPL 6:2 (2005), pp. 460–462, who takes the view that the concept of waste and term of discarding should be interpreted widely.
2.3.4 The effects of waste status

2.3.4.1 Scope of application of the WFD

The concept of waste as set out in Article 3(1) of the WFD has a critical role in the application of waste legislation and its obligations. Articles 1 and 2 of the WFD set the scope of the Directive. Article 1 of the WFD states that the WFD lays down measures to protect the environment and human health by preventing or reducing the generation of waste, the adverse impacts of the generation and management of waste and by reducing overall impacts of resource use and improving the efficiency of such use, which are crucial for the transition to a circular economy and for guaranteeing the Union’s long-term competitiveness.\(^{291}\) In other words, the scope of application of the WFD is limited to the generation and management of waste. Article 2(1) of the WFD lays down the exclusions from the scope of the Directive, which are as follows: (a) gaseous effluents emitted into the atmosphere; (b) land (in situ) including unexcavated contaminated soil and buildings permanently connected with land; (c) uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated; (d) radioactive waste; (e) decommissioned explosives; and (f) faecal matter, if not covered by paragraph 2(b).\(^{292}\)

Article 2(2) of the WFD sets out some ‘partial exclusions’ from the scope of application of the Directive. The following are excluded from the scope of the application to the extent that they are regulated under other Union legislation: (a) waste waters; (b) animal by-products including processed products covered by Regulation 1774/2002/EC,\(^{293}\) except those which are destined for incineration, landfilling or use in a biogas or composting plant; (c) carcasses of animals that have died other than by being slaughtered, including animals killed to eradicate epizootic diseases, and that are disposed of in accordance with Regulation 1774/2002/EC; (d) waste resulting from prospecting, extraction, treatment and storage of mineral resources and the working of quarries covered by Directive 2006/21/EC\(^ {294}\) and (e) substances that are destined for use as feed materials as defined in point (g) of Article 3(2) of Regulation (EC) No 767/2009\(^ {295}\) of the European Parliament and of the Council and that do not consist of or contain animal by-products. If something is considered waste, and is not covered under any of the categories set out in Article 2 of the WFD, its waste status means that it falls within the scope of the WFD. The declassification of waste through by-product or end-of-waste status can be achieved under Articles 5 and 6 respectively,

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\(^{291}\) The mention of circular economy was only added in the amendment of the WFD.

\(^{292}\) Then only partly excluded from the scope of application of the Directive.


while exclusions from the scope of the Directive can be made through Article 2.\textsuperscript{296} As they are exceptions these provisions are interpreted narrowly.

\begin{figure}[h]
\centering
\begin{tikzpicture}
  \node[anchor=east] (n1) {Is the substance or object waste?};
  \node[below right=of n1, anchor=north] (n2) {Yes};
  \node[below right=of n1, anchor=north] (n3) {No};
  \node[below right=of n2, anchor=north] (n4) {The WFD applies.};
  \node[below right=of n3, anchor=north] (n5) {Is it waste which is excluded from the scope of the WFD by virtue of Articles 2(1), (2) or (3)?};
  \node[below right=of n5, anchor=north] (n6) {Yes};
  \node[below right=of n5, anchor=north] (n7) {No};
  \node[below right=of n6, anchor=north] (n8) {The WFD does not apply.};
  \draw[->] (n1) -- (n2) node[midway, above] {Yes};
  \draw[->] (n1) -- (n3) node[midway, above] {No};
  \draw[->] (n3) -- (n4) node[midway, above] {No};
  \draw[->] (n2) -- (n5) node[midway, above] {Yes};
  \draw[->] (n5) -- (n6) node[midway, above] {Yes};
  \draw[->] (n5) -- (n7) node[midway, above] {No};
  \draw[->] (n6) -- (n8) node[midway, above] {Yes};
  \draw[->] (n7) -- (n8) node[midway, above] {No};
\end{tikzpicture}
\caption{The scope of application of the WFD.\textsuperscript{297}}
\end{figure}

\textbf{2.3.4.2 Material recovery}

Article 6 of the WFD provides that substances or objects can only cease to be waste after undergoing a recovery operation. Therefore, the substances and objects in disposal operations are always considered waste, and because no waste is ever generated in waste prevention processes nothing can be defined as waste in respect of that process. Therefore, the assessment of ceasing to be waste is limited to subjects of recovery operations. Material recovery refers to recovery operations where the waste is used as a raw material in order to manufacture new products for a different purpose of use or for the same as that for which it was used prior to its becoming waste. Material recovery operations are a key element in closing the loop.

The WFD sets out all the basic requirements for waste management operations. It also introduces a permitting requirement for all persons who are active in waste treatment, disposal and management operations. The waste hierarchy set out in Article 4 of the WFD provides that waste treatment operations should follow this priority order: prevention, preparing for re-use, recycling, other recovery, and disposal. Article 12 of the WFD provides that Member States shall ensure that, where recovery is not undertaken, waste undergoes safe disposal operations that comply with Article 13 on the protection of human health and the environment.\textsuperscript{298} Article 14 of the WFD provides that in accordance with the polluter-pays principle, the costs of waste management, including for the necessary infrastructure and its operation, shall be borne by the original waste producer or by the current or previous waste holders. The producer or the current or previous holder is also responsible for the costs of recovery operation. Article 23 of the WFD governs permitting issues and states that Member States shall require any establishment or undertaking intending to carry out waste treatment to

\textsuperscript{296} This is done in the Finnish implementation of the IED’s provisions of burning waste. The solution is discussed further in Chapter 5.

\textsuperscript{297} DEFRA: Guidance on the legal definition of waste and its application. Crown Copyright 2012, p. 28, Figure 1.

\textsuperscript{298} See C-236/92 Lombardia (1994) ECR I-485; Jans & Vedder 2012, p. 481, for the view that in practice the content of Article 13 of the WFD is not directly effective and has never been very effective.
obtain a permit from the competent authority. Member States are obliged to demand permits from waste treatment operations.\textsuperscript{299} This adds to the regulatory burden involved in using waste-based raw materials instead of virgin raw materials.

The permits must specify the types and quantities of waste that may be treated in the facility and the safety and precautionary measures to be taken as well as many other factors affecting the impacts of the use. If the wastes can be used in an environmentally friendly way, these extra permitting procedures are simply a regulatory burden that has no actual effect on the impacts of the use of the material. However, some form of permitting or monitoring mechanism is necessary to deal with waste materials that pose the risk of adverse environmental and human health impacts. According to Articles 24 and 25 of the WFD, Member States can exclude certain operations where the waste is being recovered or their own non-hazardous waste is being disposed of at the place of production. The permitting can also be carried out through the provisions of Directive 2010/75/EU\textsuperscript{300} (hereinafter the ‘Industrial Emissions Directive’ or ‘IED’). Article 4 of the IED stipulates that the Member States must ensure that no industrial installations operate without a permit. The Directive applies to industrial activities that give rise to pollution, including recovery of waste.\textsuperscript{301} Typically the WFD procedures are administratively lighter than those relating to IED permits. The Member States can choose whether to implement the permitting schemes as unified or as separate mechanisms. The latter option has proved more popular.\textsuperscript{302}

The applicable legislation on waste lays down more control and monitoring obligations than are contained in the regulatory framework on non-waste (for example the IED). Nonetheless, discovering environmentally friendly ways of utilising waste materials in production processes promotes resource efficiency and the objectives of the circular economy by prolonging product life-cycles. Unnecessary regulatory burdens based on waste status that only nominally protect the environment are hardly worthwhile incentives to use waste-based substitutes for virgin raw materials. These kinds of ‘bottlenecks’ for waste recovery can be barriers to more efficient recovery of waste.

The differentiation between waste and non-waste materials also affects shipment of the material. Although waste is included in the scope of free movement of goods under Article 34 TFEU, special provisions have been laid down for shipment of waste. The shipment of products is rather unregulated but shipment of waste has its own legal framework.\textsuperscript{303} In addition to EU law, due to the implementation of the WFD and its concept of waste, the national legislation of Member States has a significant effect on whether the concept of waste is used as an instrument to promote the objectives of the circular economy or whether it is used as an over-formulated concept that

\textsuperscript{299} See Krämer 2016, p. 362, for the view that the granting of permits in relation to waste treatment and disposal plants is, in general, subject to the provisions of national law.


\textsuperscript{301} Annex 1 of the IED. See Jans & Vedder 2012, p. 364, for the view that it is still somewhat unclear how to distinguish industrial activities from other activities. Waste management operations seem to be distinguished by scale and capacity.


\textsuperscript{303} The legislative framework on waste shipment is discussed in greater detail in chapter 3.8.3.
hinders material efficiency and the substituting of raw materials with their waste-based counterparts.

2.3.4.2 Energy recovery

Energy recovery from waste includes combustion of waste to produce energy and using waste materials in the production of fuels. Generally the waste is burned to produce energy. In energy production the waste material is used for a beneficial purpose, i.e. to preserve virgin raw materials in energy production. The IED lays down special provisions concerning waste incineration plants and waste co-incineration plants. Chapter IV of the IED focuses on energy production plants that use waste-based fuels, and sets out special rules that apply to waste incineration plants and waste co-incineration plants which incinerate or co-incinerate solid or liquid waste. The Chapter does not apply to gasification or pyrolysis plants if the gases resulting from this thermal treatment of waste are purified to such an extent that they are no longer a waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas.

Consideration of waste status is crucial with regard to the application of the special rules for solid and liquid materials. If such materials are considered waste, the special regulatory framework applies. If not, it does not apply. The application of waste legislation to waste-based energy production gases depends on the nature of the emissions caused by the incineration, since pursuant to Article 2(1) of the WFD most gases are excluded from the scope of the WFD. Chapter IV of the IED lays down high standards for controlling and monitoring emissions caused by incineration together with operational conditions on the burning of materials classified as waste. For example, Article 50(2) of the IED requires waste incineration plants to be designed, equipped, built and operated in such a way that the temperature of the gas resulting from the incineration of waste is raised, after the last injection of combustion air, in a controlled and homogeneous fashion and even under the most unfavourable conditions, to at least 850°C for at least two seconds. Provisions on incineration temperatures and other operational provisions are not necessary from the point of view of the protection of the environment and of human health if the waste materials do not contain substances that need to be destroyed by high temperatures.

In addition to ensuring a high level of protection, the regulatory burdens imposed in respect of waste treatment can also have unfortunate impacts on the resource efficiency of the operations involved. The additional requirements may result in avoiding waste recovery in energy production and in the inability to obtain the investment needed in order to start producing energy from waste. The cost of using waste for a beneficial purpose with no adverse environmental or human health impacts should not be bigger than that of waste disposal. Otherwise the circular economy objectives are not well-incentivised. However, this does not mean that waste materials that have environmental and human health impacts should be used in recovery processes or be removed from the scope of application of the WFD. Waste status and the legislative framework around it should cover all necessary substances: it should be wide enough...

304 Using waste in energy production of fuels could mean, for example, manufacturing producer gas for energy production from waste.

305 See e.g. Van Calster 2015b, p. 365.
to cover the risks posed by waste but have sufficient leeway in order not to complicate environmentally friendly processes.

2.3.5 The concept of waste and the precautionary principle

Due to the effects of waste status, as stated above, it could be argued that the concept of waste is a barrier for efficient material use, recovery and circular economy. However, then the function of the concept of waste would be forgotten. The concept of waste is interpreted widely in the light of the precautionary principle. The special provisions on the use of ‘waste’ have been drafted to apply additional control measures ensuring a high level of protection for the environment and for human health when the properties of the waste and the possible risks connected with its use are unknown. The environmental impacts that may be caused by a substance that has not been classified as waste play a central role in relation to fulfilling the by-product or EoW criteria. However, the environmental risks posed by a non-waste material do not trigger the classification as waste without the substance or object being discarded.

One of the key aims of the provisions on the declassification of waste at EU level is to offer a means of assessing whether, in respect of particular waste streams, the legal framework governing their use should apply or should it be replaced by a different and more appropriate regulatory framework.

The adoption of strict controls and precautions in waste management makes sense, taking into consideration that there have been numerous examples of how bad waste management and inadequate control measures have caused severe environmental and human health impacts. While some of these WFD interventions are precautionary in nature, most of them actually apply the prevention principle. However, the interpretation of the concept of waste is based on the precautionary principle. The connection between the two principles is generally implied in Article 191(2) TFEU, which states that Union policy on the environment shall aim at a high level of protection taking into account the diversity of situations in the various regions of the Union. That environmental damage should be rectified at source and the polluter should pay are established principles of environmental law.

The Commission has emphasised that legislation on the concept of waste and exclusions from its scope are intended to clarify the legislative framework for operators in the recycling business and ensure a level playing field in relation to the circular economy. The widely applied concept of waste can create an over-inclusive framework for waste management and hinder the re-use of waste in production.

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308 Further division between two principles aiming for a high level of protection of environment and human health is not necessary. Throughout the dissertation the provisions on waste are mostly referred to as ‘additional provisions on waste’ or the ‘precautionary measures’ concepts.

processes by over-regulating its utilisation. The legislation on similar non-waste products starts to apply, instead of waste legislation, once a substance ceases to be waste. Non-application of the precautionary provisions contained in the WFD means that the waste-based product falls outside the scope of waste legislation and the relevant control mechanisms are derived from another legislative framework.

Generally speaking, the control measures contained in waste legislation are applied to all wastes and lay down more administrative obligations than the regulatory framework governing any specific product. The additional control measures contained in the waste legislation aim to cover all kinds of environmental and human health problems that may be caused by all kinds of waste materials. It is likely that the application of these precautionary principles achieves greater stringency in practice than the specific quality control requirements applicable to a certain product. The idea of the precautionary principle widening the interpretation of ‘waste’ is deeply rooted in the fact that, because the quality and properties of all waste cannot be known, all kinds of harmful impacts must be prevented. A better-safe-than-sorry approach is taken, which results in most of the measures being applicable to completely harmless waste materials due to the fact that they are not specifically separated from the general volume of waste. Due to this lack of knowledge on the properties of the waste materials, their use cannot be regulated without applying general overarching precautionary provisions and measures.

Waste legislation can, somewhat ironically, function as a barrier to the closure of more efficient waste recovery. The application of waste status serves a useful purpose where the precautionary measures of waste legislation prevent the negative impacts of the waste. Where it can be demonstrated that there is no negative impacts in regards to recovering a certain waste, the waste status and waste legislation should not apply. In this way, exclusions from the concept of waste may be used as instruments to ensure that there is a level playing field for waste-based and virgin products.


311 REACH plays an important part in the governance of materials ceasing to be waste and offers quality control and environmental and human health protection. Drawing a line between the WFD and REACH is discussed further in the next section.


313 Cheyne, Ilona, ‘Taming the Precautionary Principle in EC Law: Lessons from Waste and GMO Regulation’, JEEPL 4 (6) 2007, p. 475. Cheyne argues that general and pervasive provisions governing waste, such as these, are liable to hinder the clarity and precision of the legislation as well as create inappropriate regulatory burdens for the use of waste materials.
2.4 HAZARDOUS WASTE

Article 3(2) of the WFD defines hazardous waste as waste which displays one or more of the hazardous properties listed in Annex III. 314 Annex III, which was amended by Commission Regulation 1357/2014, 315 characterises certain hazardous waste as ‘explosive’. According to Article 3(2a) wastes that are not included in the definition of Article 3(2) of the WFD are non-hazardous. This refers to waste that is capable, as a result of chemical reaction, of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings. Pyrotechnic waste, explosive organic peroxide waste and explosive self-reactive waste are included in this category; and ‘oxidising’, which refers to waste that may, generally by providing oxygen, cause or contribute to the combustion of other materials is also mentioned as a feature. Hazardous wastes are considered hazardous due to their features and due to the additional care needed in their treatment. 316 The Commission has drafted a guidance document on the correct interpretation of the concept of hazardous waste. 317

The properties of Annex III are further specified in the List of Wastes Decision, in respect of which the provisions on hazardous wastes were amended by Decision 2014/955/EU. 318 The fact that their impacts on the environment and on human health are normally more severe than ‘normal wastes’, does not necessarily mean that they cannot be used in recovery operations. Nevertheless, Article 7(3) of the WFD provides that where a Member State has evidence to show that specific waste that appears on the list as hazardous waste does not display any of the properties listed in Annex III, it may consider that waste to be non-hazardous waste. 319 The Member State shall notify and provide the Commission with the necessary evidence. In the light of notifications received, the list shall be reviewed in order to decide on its adaptation.

Additional requirements apply in respect of the collection and waste treatment options in respect of hazardous wastes as compared to those available for non-hazardous wastes. Article 7(4) of the WFD provides that the reclassification of hazardous waste as non-hazardous waste may not be achieved by diluting or mixing the waste with the aim of lowering the initial concentrations of hazardous substances to a level below the thresholds for defining waste as hazardous. This provision lays down a general prohibition on mixing hazardous waste with non-hazardous.

The hazardous waste status of a waste material is dependent on two questions. The first question is whether the WFD applies to the substance or object; i.e. is the material considered to be waste and do any of the exclusions set out in Article 2 of the WFD apply to it? If the substance or object is not waste or exclusion is available, it

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314 This solution codifies the judgment of the CJEU in C-318/98 Fornasar (2000) ECR I-4785, para. 56.
316 As the hazardous properties are listed in the Annex of the WFD the classification of waste as hazardous is clear textual interpretation despite the fact that the content of the hazardous properties can be open for interpretation. Nonetheless, the properties cannot be interpreted through legal analysis but through the technical information and chemical features of the wastes.
319 See also C-194/01 Commission v Austria (2004) ECR I-4579.
cannot be hazardous waste in the sense of the WFD. The second question is whether the waste is considered hazardous or non-hazardous under the list of wastes. The list of wastes divides wastes into several chapters (with two-digit codes), which are in turn divided into sub-chapters (with four-digit codes), which again are divided into entries (with six-digit codes). All wastes marked with an asterisk (*) in the list of wastes are considered hazardous. Other entries are considered non-hazardous. These two categories are called absolute hazardous and absolute non-hazardous entries.\textsuperscript{320}

The third option is a mirror entry, which denotes that the waste is a pair of at least two alternative entries. The possible pairs are a mirror hazardous entry (marked with an asterisk (*)) and a mirror non-hazardous entry. Classification of a mirror entry as hazardous or non-hazardous entails three additional steps. First, if the waste composition is not available, it is considered hazardous due to the possible presence of unknown elements of the composition. Second, if the composition is available, it is still considered hazardous if it displays any hazardous properties.\textsuperscript{321} Third, if it is unavailable, the last question is whether the waste contains any persistent organic pollutants (POP) above the limit values set out in the list of wastes. If it does, it is considered hazardous. If it does not, it is considered non-hazardous.\textsuperscript{322}

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\textsuperscript{321} Such as carcinogenic, explosive or flammable properties.


Articles 17 to 20 of the WFD set out a further legislative framework for managing hazardous wastes. Article 17 provides that Member States shall take the necessary action to ensure that the production, collection and transportation of hazardous waste, as well as its storage and treatment, are carried out in conditions providing protection for the environment and human health in order to meet the provisions of Article 13 of the WFD, including action to ensure traceability from production to final destination and control of hazardous waste in order to meet the requirements of Articles 35 and 36 of the WFD. Article 18 of the WFD sets out an absolute ban on mixing hazardous waste with other categories of hazardous waste or with other waste, substances or materials. Article 19 regulates the labelling and packaging of hazardous wastes. The WFD requires, on a general level, that Member States adapt the basis on which permits are issued to the specific challenges of the management of hazardous waste.324

Article 20(2) of the WFD states that Articles 17, 18, 19 and 35 do not apply to mixed wastes from households. However, hazardous domestic waste is subject to the provisions governing hazardous waste, save for those on labelling and record keeping. These wastes may include, for example, cleaning agents and electrical waste.325

Despite all the additional provisions on hazardous wastes, the regulatory framework that governs them is broadly similar to that which applies in respect of other wastes and the same main principles apply to their management. Due to the stricter regulation of hazardous wastes, non-classification as waste could theoretically have an even bigger enabling effect on them than is the case in respect of non-classification as waste of normal non-hazardous wastes. It must, however, be taken into account that hazardous wastes are considered hazardous because of their unsafe properties and the risks they pose to the environment and to human health. Therefore, the additional measures on hazardous waste management are not often mere bottlenecks. If such materials ceased to be waste their post-waste regulation would probably involve strict control and monitoring mechanisms as is already the case for the legislative framework that governs them.

2.5 DISTINCTION BETWEEN WASTE AND RESIDUE

The legislation governing renewable energy uses the concept of waste alongside that of residue. Residue is not a concept that is used in EU waste legislation and should not, therefore, be viewed as having any legal impact on the provisions of the WFD or other waste legislation. However, the concepts of waste and residue can have legal impacts in respect of the regulation of renewable energy even though they are not defined in Directive 2009/28/EC326 (hereinafter the ‘Renewable Energy Directive’). Originally these concepts were included in the renewables regime in order to create material classifications for double counting and promoting the use of such materials in energy production. The incentives for this have been laid down rather artificially

324 See Van Calster 2015a, p. 92, for the view that exemptions from permit requirements in relation to hazardous wastes in recovery operations are of greater interest than the permits themselves. Such exemptions cannot be granted in relation to disposal operations.

325 Electrical wastes are subject to a different legal framework.

in the applicable legislation and some of the provisions containing these incentives will be repealed in the near future.327

The concept of residue derives from the concept of ‘processing residue’ under Article 1(13) of Directive 2015/1513/EU328 (hereinafter the ‘ILUC Directive’), which amends Article 2 of Directive 98/70/EC,329 and means a substance that is not the end product(s) that a production process directly seeks to produce; it is not the primary aim of the production process and the process has not been deliberately modified to produce it.330 The concept of residue also includes agricultural, aquaculture, fisheries and forestry residues, which in the new regulatory framework refer to residues that are directly generated by agriculture, aquaculture, fisheries and forestry and do not include residues from related industries or processing.331

The concepts of residue and waste are used in parallel in the legislation on renewable energy. From a waste legislation perspective it is unclear whether the substances that are considered residues under the ILUC Directive are wastes or not as the concepts of waste and residue are separated in the Renewable Energy Directive. This interpretation is backed up by the fact that under the WFD all substances and objects are either waste or non-waste.332

As waste and residues are often regulated in parallel under the legal regime on renewable energy, it makes no difference on whether the materials are considered waste or residue within the renewables scheme.333 Nonetheless, waste status is conclusive for the application of the WFD. Residues can double as wastes and residues at the same time, but this makes no difference from the point of view of renewables legislation.

The Commission has stated that the concepts of waste and residue should be interpreted in line with the objectives of the Renewable Energy Directive: (1) for the double counting: diversification of feedstocks; and (2) for the greenhouse gas methodology: no emissions are allocated to co-products which production did not aim for, such as straw in the case of wheat production. The Commission has also confirmed that the concept of waste should be understood in the same way in relation to the Renewable Energy Directive as under the WFD, and that raw materials intentionally modified to qualify as waste (e.g. by adding waste material to a non-waste material)
should not be considered eligible for receipt of renewables incentives for using waste and residue-based fuels. The conceptual distinction between the ILUC Directive and the WFD lies in the fact that while all materials are either non-waste or waste under the WFD, the renewables regime provides for a middle ground in the form of residue that is not a product (at least in the Renewable Energy Directive) but is not necessarily waste. The position of by-product and EoW status is unregulated and they are not automatically considered to qualify for the benefits for wastes and residues under the Renewable Energy Directive if they cannot be classified as residues. The significance of the distinction will reduce as and when the provisions on double counting are repealed.

However, the middle ground classification as residue of material that is not necessarily waste or non-waste remains. With increased legal certainty concerning the obligations laid down in the legislation on waste and uniform interpretation of the concept, the concept of residue could potentially be used as an instrument to promote circular economy objectives. This might occur, for example, in relation to the management of biomasses by creating room for incentives prior to the application of the more onerous control mechanisms under EU waste legislation that come into play after the substance or object is discarded and classified as waste. On a conceptual level, this middle ground classification could even allow for new kinds of waste prevention measures that enable the use of the material as non-waste residue rather than recovering waste after it has been discarded. Nonetheless, the current relationship between residues and the EU’s waste legislation lacks both logic and legal certainty. Systematic approach cannot be taken in interpreting the concept residue due to the fact that it is not in the same legal framework (or system) as the concepts of waste legislation. The concept of residue should be interpreted textually outside the system of waste legislation and therefore it does not hold a meaning in relation to the obligations and definitions of the WFD.

2.6 SUMMARY

The EU’s waste policy is directed through a few key concepts. This chapter has examined the position of the waste hierarchy, the distinction between recovery and disposal operations, and the concept of waste under Article 3(1) of the WFD, which is the key concept of the whole legislative framework. The waste hierarchy provides a general framework on prioritising different waste treatment options. This hierarchy is aimed at promoting waste treatment options where the maximum value is gained from the life-cycle of the product either through longer or multiple life-cycles. Article 4(2) of the WFD requires Member States to take measures to encourage the options that deliver the best overall environmental outcome. The waste hierarchy sets out grand objectives and promotes the best available waste treatment alternatives and, in this sense, offers a good way of endorsing the objectives of the circular economy. However, the biggest problem with the hierarchy is the small number of concrete legal obligations it lays down in practice. For the most part it suffices for Member States

to merely strive to achieve the objectives set out under the hierarchy. The key to achieving the aims of the waste hierarchy is the effective implementation of its content in other legislation through which those aims can be put into practice.

The concepts of recovery and disposal operation serve a necessary purpose in waste legislation. The main difference between the two is that in recovery operations the waste serves a useful purpose and fulfils a beneficial function while in disposal operations the waste serves no useful purpose either in a plant or in the wider economy. A waste treatment operation is considered a recovery operation in two cases: (1) it substitutes a virgin material and fulfils its function; or (2) waste fulfils another useful purpose in the waste treatment facility or basically anywhere else. In many recovery operations the degree of substitutability between the virgin raw material and the waste material is clear. Nevertheless, direct substitutability between a raw material and a waste-based material is not necessary in all recovery operations. The definition set out in Article 3(15) indicates that recovery status also applies to waste material that no longer poses waste-related risks and is ready to be used as a raw material in a process. The provisions on waste material serving a useful purpose in the wider economy were originally designed to acknowledge efficient waste-to-energy facilities as recovery operations: in many cases the waste itself does not substitute virgin fuel products but is used in different kinds of incinerators in order to produce energy.

Article 3(1) of the WFD states that ‘waste’ means any substance or object which the holder discards or intends or is required to discard. The case-law on waste status is one of the most extensive areas of case-law handled by the CJEU. The concept of waste and its exclusions can function as important tools for promoting the circular economy and the waste hierarchy. Interpretation of the concept of waste should be done in a holistic manner and no single factor is conclusive on the subject. Inclusion in the EU’s list of wastes does not necessarily mean that the substance or object is considered to be a waste. The substances and objects that are waste fall within the scope of the WFD.

Waste status also has other impacts, such as increased control and monitoring of the use of the substance or object. For example, using wastes in production processes often requires different kinds of permits to those required when using virgin raw materials. This should not be understood to mean that additional control and monitoring of waste for the environmental and human health impacts of using waste are unnecessary. However, the concept is interpreted widely and can prove to be over-inclusive. It should be taken into account that even if the waste legislation does not apply to a substance or object, it is usually subject to strict regulation under the applicable legislation on similar products. Waste can be classified as hazardous on the basis of its properties. The regulatory framework on hazardous waste is stricter than that governing the management of ‘regular’ waste.

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335 van Kempen 2014, pp. 149–156.

3 EXCLUSIONS FROM THE CONCEPT OF WASTE

3.1 INTRODUCTION

3.1.1 Drawing a line between waste and non-waste

The WFD provides for two exclusions from the concept of waste. Article 5 of the WFD sets out the criteria for objects or substances to be classified as by-products and Article 6 sets out the criteria for objects or substances to cease to be waste.\(^{337}\) After an extensive continuum of CJEU case-law the criteria for excluding from the concept of waste are codified in the WFD. However the criteria cannot be assessed purely through textual approach and the traditional sources of textual interpretation due to the fact that it includes ambiguous wording of the criteria and the technical differences between different waste streams.\(^{338}\) The criteria are interpreted taking into account the systematic and the teleological aspects of the regulation on excluding from the concept of waste.\(^{339}\)

The possibility of obtaining exclusion from the concept of waste and thus avoiding the waste ‘stigma’ promotes the utilisation of waste and the circular economy. The previous chapter concluded that waste status makes the regulatory burden associated with the utilisation of waste heavier but at the same time ensures a high level of protection of the environment and of human health. To state the obvious, once a waste-based substance or object is no longer waste, the WFD or other legislation on waste no longer applies to it.

The rationale behind the exclusions from the concept of waste is not to circumvent or lighten the ‘burden’ of environmental or human health protection but to promote the use of materials that would be considered waste only on the basis of an over-inclusive interpretation of the concept of waste.\(^{340}\) The two routes to non-waste status are clear regulatory innovations towards more efficient waste management and circular economy.

Considering the environmental legal basis of the WFD and its aim of regulating substances and objects that ‘the holder discards or intends or is required to discard’, \(^{341}\)

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\(^{337}\) See Van Calster 1997, p. 137, for the point that originally ceasing to be waste became to be known as the Tombesi bypass because it circumvented the difficult question of finding a comprehensive definition for ‘discarding’. Also see Pike 2002, p. 202.

\(^{338}\) See Bengoetxea 1993, pp. 64–65.


\(^{340}\) This is taken into account in the interpretation of the criteria in order to reach effet utile of the regulation.

\(^{341}\) Article 3(1) of the WFD. The definition of waste has a stronger influence on whether a substance or object is waste than the list contained in the List of Wastes Decision.
it is not necessary to regulate all material that would normally be classified as waste under the provisions of general waste legislation if this cannot be justified by reference to the environmental or human health impacts of its utilisation. Waste status also applies to recovery operations that prolong the life-cycle of the material. These operations should be preferred over disposal operations. The system of exclusions follows the logic of prolonging the material-cycles of safe materials and limiting the circulation of materials that have dangerous features. Suitable subjects for exclusion from the concept of waste include those that do not require the framework of waste legislation to ensure their safe use.342

3.1.2 Differences in scope of application

Different kinds of material stream are suitable for by-product status and end-of-waste status even though the main idea behind both is quite similar. By-product status is exclusively aimed at production residues (not to be confused with ‘residue’ as discussed in chapter 2.5). Production residues are materials that are something other than – and should be distinguished from – the material whose production is the main aim of the production process, and they may or may not be wastes.343 The main products of the process are not waste.344 Given the basic rule that all materials are either waste or non-waste, by-products should be considered non-waste from the start.345 Nonetheless in general, production residues are likely to be waste: if they are not by-product, they are waste.346 The strict separation between the possibilities to receive by-product and end-of-waste status is textual, considering the fact that if the production residues are not by-products, they are waste and thus eligible for end-of-waste status.

The end-of-waste criteria were created for a wide range of waste streams while by-product status is limited to production residues. The end-of-waste criteria can be applied to all kinds of waste streams. End-of-waste status has a close connection with the definition of recovery operation contained in Article 3(15) of the WFD. In an end-of-waste procedure the substance or object remains waste up until the point when the final recovery operation has been completed. The end-of-waste criteria can also apply to production residues if they are not classified as by-products, because production residues can alternatively be considered as waste. The distinction between waste and production residues is perhaps exaggerated in the by-product assessment. Production residues are never classified as waste before attaining by-product status, but if they do not qualify as a by-product they are considered waste.

342 Of course, the provisions of the WFD will be replaced by provisions governing similar products. In that sense, exclusion from the concept of waste does not necessarily lighten the legislative framework under which the substance or object is used.

343 C-9/00 Palin Granit (2002) ECR I-3533, para. 32.


345 See European Commission: Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, p. 15, for the point that a decision on whether a substance or object is a by-product must in the first instance be made by the producer of the substance or object, together with the national authorities.

3.2 BY-PRODUCTS

3.2.1 Introduction to the by-product criteria

The classification of by-products is mostly based on the case-law of CJEU on the application of the concept of waste. Article 5 of the WFD provides as follows:

Member States shall take appropriate measures to ensure that a substance or object resulting from a production process the primary aim of which is not the production of that substance or object is considered not to be waste, but to be a by-product if the following conditions are met:

(a) further use of the substance or object is certain;
(b) the substance or object can be used directly without any further processing other than normal industrial practice;
(c) the substance or object is produced as an integral part of a production process; and
(d) further use is lawful, i.e. the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

Substances or objects can be classified as by-products following the application of these criteria. The criteria contained in Article 5 of the WFD are almost identical to those set out by the CJEU in Palin Granit. When considering the lawfulness of the use of the by-product, it must be taken into account that waste legislation applies if the substance or object is classified as waste but does not apply if it is classified as a by-product. The legislative framework applicable to by-products is the same as that applicable to similar non-waste products. Article 5 of the WFD also offers the possibility of laying down, through the examination procedure, EU-wide technical criteria for certain material streams and their by-product status. Classification as a by-product is possible at national level and on a case-by-case basis if no legislation on the subject exists at EU level. In the first instance the decision on whether a substance or object is considered a by-product is made by the producer of the material and the national authorities based on the provisions of the WFD.

The starting-point for classification as a by-product is that it is produced alongside the primary products in the production process. By-products are produced as an incidental part of the main production process. If the production of the substance or

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348 See chapter 3.5.
350 See European Commission: Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, p. 15, for the view that the possible by-product is not considered a product to start with but a production residue which is manufactured as something other than the end product that the process directly aims to produce.
object alongside the primary product is the result of a deliberate plan or of technical choices made in relation to production, it is a product and not a waste to begin with.\textsuperscript{351}

### 3.2.2 Certainty of further use

According to the first limb of the criteria set out in Article 5 of the WFD, the further use of the material must be certain. Its economic value does not affect this per se, but the level of certainty of the further use is usually based on the demand for and availability of the material.\textsuperscript{352} Furthermore, potential demand and further use do not suffice to satisfy the first criterion: the further use must be certain. The rationale behind the first criterion is that materials whose further use is uncertain should remain waste. The case-law of CJEU indicates that a substance or object can be classified as a by-product instead of waste when it is ready for further use when it is generated.\textsuperscript{353} It is possible that the production residue is generated in such a volume that only a part of it can be placed into further use. In these cases the overproduced side streams of the production remain within the ambit of the concept of waste because only a part of it is destined for further use. For example, an undefined period of storage does not constitute certain further use in relation to the by-product criteria.\textsuperscript{354} On the other hand, in \textit{Commission v Spain} part of the manure produced was not considered waste when only the amount necessary for fertilisation was stored.\textsuperscript{355}

Waste is not necessarily worthless, and a by-product is not necessarily valuable as such.\textsuperscript{356} Nevertheless, in assessing the probability of the waste material being utilised, the economic benefits gained by the producer should be regarded as an indication of a certain purpose of further use.\textsuperscript{357} This assessment should take into account the overall economic benefit to producers: in order to utilise a by-product, further processing, such as the homogenisation of the material stream, may be required, and this may decrease the returns achieved by using the materials as substitutes for virgin raw materials. If production and processing costs are high it is less likely that using residual materials instead of virgin raw materials will in fact be beneficial.\textsuperscript{358}

There are no clear standards that may be applied in order to assess the certainty of further use, but it may be indicated by the existence of contracts between the material producer and its user, financial gain accruing to the material producer, the presence

\begin{itemize}
\item[\textsuperscript{352}] See e.g. de Sadeleer 2005, p. 460.
\item[\textsuperscript{353}] C-444/00 \textit{Mayer Parry} (2003) ECR I-6204.
\item[\textsuperscript{354}] C-9/00 \textit{Palin Granit} (2002) ECR I-3533
\item[\textsuperscript{355}] C-416/02 \& C-121/03 \textit{Commission v Spain} (2005) ECR I-07487. See COM (2007) 59 final, p. 8. See C-113/12 \textit{Brady}, ECLI:EU:C:2013:627, para. 43, for the point that a longer period of storage can be acceptable if further use can be ensured with firm commitments to take the delivery and on the basis of the seasonal nature of the operation using the by-product.
\item[\textsuperscript{358}] See COM (2007) 59 final, p. 8.
\end{itemize}
of a solid market, and the fact that the material upholds the same quality standards as other products on the same market. On the other hand, uncertainty of further use may be indicated by the lack of an obvious market for the material, the existence of unnecessary parts of the streams that are discarded, or the processing costs exceeding the financial gain from further use.\textsuperscript{359}

### 3.2.3 Criterion of normal industrial processing

In Euro Tombesi Advocate General Jacobs proposed that if a residue cannot be used in a normal industrial process without undergoing recovery, it should be defined as waste until it is used in a recovery operation.\textsuperscript{360} Since only waste materials can be subjected to recovery operations, in order to be classified as a by-product the substance or object cannot be subjected to recovery. Drawing a line between normal industrial processes by which products are produced and normal waste treatment operations such as recovery can sometimes be difficult. Article 5 of the WFD provides that a substance or object cannot be defined as a by-product if the further processing goes beyond normal industrial processing. The interpretation of the criterion of normal industrial processing might cause problems since the ‘normality’ of the further processing methods is often debatable. Consequently, practitioners in the field may have a huge impact on interpretation because they possess the best possible knowledge as to whether a particular further processing method may be considered to be ‘normal’ in production.\textsuperscript{361}

The residue must be available for use with normal industrial processing or no processing at all if it is to be defined as a by-product. If the use of the residue requires extensive modification of its properties or consistency, the substance or object is waste and not a by-product. Processing methods that have been considered ‘normal industrial processes’ include washing, drying, homogenisation, adding necessary materials, and carrying out quality control.\textsuperscript{362} This list is non-exhaustive and assessment of different operations should be done on a case-by-case basis. The basic rule is that by-product status is supported by the most direct possible link between a residual material and its purpose of use.\textsuperscript{363} Distinguishing between normal industrial processes and recovery operations can prove a bit tedious as both pre-processing categories may include the same kinds of processing measures but these can only apply to materials that are explicitly classified as non-waste or waste. However, in this context these operations could not be regarded as recovery operations since materials that are considered waste are not subjected to them. If the only imagined use for the material is similar to an


\textsuperscript{360} Advocate General’s opinion in C-304/94 Euro Tombesi (1997) ECR I-03561.

\textsuperscript{361} See Krämer 2016, p. 372

\textsuperscript{362} To make it even more complicated, all these processes could also be categorised as recovery operations within the meaning of Article 3 of the WFD. However, that would mean that the material would have to be waste and could not be a by-product.

operation that is considered to be disposal, the processing is probably not a normal industrial practice and the materials should be considered to be waste.\footnote{COM (2007) 59 final, p. 9. See e.g. C-9/00 Palin Granit (2002); C-457/02 Niselli (2004) ECR I-10853.ECR I-3533.}

Quality control should also be considered an acceptable processing method for a by-product. This seems logical since it enables achievement of the last criterion: varying quality of a by-product could cause unpredictable environmental and human health impacts. It would also seem that processing done to the substance or object that can be viewed as an inseparable part of its production process should not be a barrier to by-product status. However, if further processing is required, the material is considered waste before that processing is completed because otherwise the further purpose of use is not certain.\footnote{See C-114/01 AvestaPolarit Chrome Oy (2003) ECR I-8752.} By-product status appears not to be endangered by light further processing operations if they are done to ensure the certainty of the further purpose of use.\footnote{See COM (2007) 59 final, pp. 8–9.}

### 3.2.4 Produced as an integral part of a production process

The third by-product criterion is that the substance or object must be produced as an integral part of a production process. This criterion aims to ensure that by-product status is only applied to production residues and not to wastes or products. It overlaps with that of normal industrial processing, since both criteria aim to ensure that the further use of the substance or object is available for the planned purpose of use in a recovery operation as directly as possible. This ensures that by-product status is not used as a means of circumventing either the obligations and responsibilities or the limits on temporary storage set out in the applicable waste legislation.\footnote{C-9/00 Palin Granit (2002) ECR I-3533.}

Some indication as to whether the material is produced ‘as an integral part of a production process’ may be obtained by considering the nature and the extent of the tasks needed to prepare the material for direct further use and how these tasks relate to the main production process.\footnote{European Commission: Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, p. 19.} In respect of this criterion it is crucial that the substance or object is produced as an inseparable part of the production process. This evaluation should be based on an assessment of the possibilities for recovery, the extent of the processing required prior to the further use, how closely linked these processes are to the primary production process and who carries them out. By-products should be produced in direct relation to the primary production process. BREF documents can indicate the kinds of different residual substances and objects that are produced as an integral part of the production process.\footnote{COM (2007) 59 final, p. 9.} The CJEU has ruled that the term ‘production process’ should be interpreted in a strict sense rather than in a broad sense.\footnote{C-9/00 Palin Granit (2002) ECR I-3533; C-457/02 Niselli (2004) ECR I-10875; C-416/02 & C-121/03 Commission v Spain (2005) ECR I-07487.} Thus, in order for a residual substance or object to be defined as
a by-product, the connection with the primary production process should be fairly direct and close. This is also important from the point of view of the circular economy, as it incentivises reduction of the residual material stream to its minimum.

Shipment of material prior to its use refers to the fact that the substance or object is not, in fact, produced as an integral part of a production process. Nevertheless, in view of industrial specialisation this is not always so. In Brady the CJEU ruled that slurry could be classified as by-product, despite the fact that its producer sold it to farmers as a fertilising product. It went on to say that this classification held where the producer intends to market the slurry on terms economically advantageous to himself in a subsequent process, provided that such re-use is not a mere possibility but a certainty, without any further processing prior to re-use and as part of the continuing process of production. If the undertaking seeks to limit the quantity of material produced, it would imply that the material in question should be considered waste.

### 3.2.5 The lawfulness of the further use

The fourth by-product criterion is that the substance or object fulfils the requirements that are laid down in other legislation and does not cause negative environmental or human health impacts. The criterion allows for the substance or object to be used after it is classified as a by-product, at which point the other applicable legislation on similar products starts to apply instead of the WFD. This criterion highlights the importance of environmental and human health impacts in relation to by-product status. In addition, it requires a special focus on recognising the control mechanisms regarding protection of the environment and of human health that derive from the waste legislation. These provisions do not apply in respect of the use of a substance or object after it is defined as a by-product. The CJEU has emphasised that if the overall environmental and human health impacts of the further use of the substance or object are big, it should be treated as waste.

The indications given by the Commission as to fulfilment of the criterion of lawfulness are that: (1) the material should meet the technical specifications relevant for its further use; and (2) when no such specifications exist, using the material in the purpose is not specifically forbidden. On the other hand, if the material does not meet the technical specifications or if its use for such a purpose is banned, it will not comply with the criterion. It seems clear that in situations where the residual material is perfectly interchangeable with a lawfully produced product and requires no additional regulation or supervision beyond the provisions applicable to its primary material counterpart, there is no need for it be classified as waste.

In addition to lawfulness of use the criterion also requires that use of the production residue does not lead to overall adverse environmental or human health impacts. The

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372 C-113/12 Brady, ECLI:EU:C:2013:627.
impacts of by-product status should be assessed taking into account the impacts of using primary raw materials and the positive factors associated with their replacement with residual by-product substitutes. This assessment includes harvesting the primary raw materials, diverting materials from landfilling or other disposal operation and all other possible impacts of the material’s life-cycle. Assessment of whether applying waste status and the provisions of waste legislation reduce the impacts on the environment and on human health of using the material gives a good indication as to whether the material is or is not waste. Material excluded from waste status should have neutral or preferably positive impacts in relation to the overall environmental and human health effect of using the material.\(^{377}\) If its use would have a high impact on the environment or on human health or special protection measures would be needed in order to prevent such impacts the material should be considered waste.\(^{378}\) Carrying out a life-cycle assessment of the overall impacts of by-product classification is, understandably, rather complicated. Therefore, the emphasis should probably be put on evaluating the possible risks of using production residues instead of virgin materials. If there are none, it is rather obvious that using such by-products is the better option due to the more efficient use of material resources in production that it represents.

### 3.3 END-OF-WASTE CRITERIA (EOW)

#### 3.3.1 Introduction to EoW

Article 6 of the WFD provides as follows:

‘Member States shall take appropriate measures to ensure that waste which has undergone a recycling or other recovery operation is considered to have ceased to be waste if it complies with the following conditions:

1. the substance or object is to be used for specific purposes;
2. a market or demand exists for such a substance or object;
3. the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products; and
4. the use of the substance or object will not lead to overall adverse environmental or human health impacts.’

The Article is referred to as the end-of-waste criteria (EoW). These resemble the criteria for by-product status but apply to all waste streams. The EoW criteria were originally intended to provide more stable and permanent guidance on whether a substance or object ceases to be waste, given that by-product status is mostly used within administrative decision-making. However, the same regulatory levels are available for both exclusions from the concept of waste in relation to EU and national legislation and case-by-case decision-making.

\(^{377}\)The end-of-waste criteria are examined more closely in the next chapter.

EoW criteria can apply to all wastes while by-product criteria only apply to production residues. EoW products are not necessarily produced at a certain point of a certain operation but can come from anywhere as long as they meet the criteria for such waste streams under Article 6 of the WFD. By-product status fits well with short-loop utilisation where the material is immediately taken back into production, while EoW products can return to recovery operations and production following a longer recycling loop and after being classified as waste.

For a substance or object to cease to be waste on the basis of the EoW criteria it must fulfil the cumulative criteria laid down in Article 6 of the WFD. An EoW product ceases to be waste only after it has undergone a conclusive recovery operation.379 This means that the substance or object must fulfil all these criteria at the same time.380 Some of the criteria seek to fulfil the same purposes and partly overlap.

**3.3.2. Used for specific purposes**

The first criterion set out in Article 6 of the WFD is that the substance or object is to be used for specific purposes. The criterion ensures that the waste material goes to a recovery operation and not in reality to a disposal operation. It has been criticised on the basis that it often restricts the regulation of EoW to the most common and economically viable recovery solutions and does not give a good indication381 of the possibilities of such regulation.382 The criterion has a clear connection with that of the market or demand and fulfilling these criteria requires the same kinds of features of the waste materials.383 The criterion of specific purpose should guide waste treatment towards profitable and environmentally friendly recovery operations.384 EU waste policy has sought to guide waste streams towards certain waste recovery measures for a long time by means of the waste hierarchy and other similar waste treatment schemes.

The future legislation and impacts of the waste material are naturally tied to the purpose in question: it is obvious that, for example, that the regulatory framework for material recovery is different from that for energy recovery. To date fulfilment of the criterion in the regulation of EoW at EU level has seemed unproblematic since

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379 See Pike 2002, pp. 205–207, for an early assessment of what completing or undergoing a recovery operation could be.

380 See Tromans 2001, p. 145, for the point that even in early stages of legislation on ceasing to be waste, merely undergoing a recovery operation was not considered enough to cease to be waste.

381 See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 374, for the point that to maximise the benefits of EoW regulation sorting out the target waste stream should start as early as possible.

382 Study on the selection of waste streams for End of Waste assessment: Final report. JRC Scientific and Technical Reports. European Union 2009, p. 29. Instead of focusing on the existence of a commonly used purpose, the JRC proposed information about re-use and recycling of the substance or object for the first criterion.


384 On the one hand the first criterion ensures the actual use of the waste material and restricts its impacts on the environment, but on the other hand it hinders incentivisation of innovative waste recovery operation by tying the EoW possibility to the most common purposes of use and most common production processes.
materials such as glass cullet, copper and steel scrap have always mostly been used to produce new materials.385 The demand for material for such use is stable and there is a clear market for such material.386 This seems to be the situation for many of the valuable waste materials that can be recovered as new materials.387 Problems with the EoW criteria may arise when there is no clear and single most profitable and common purpose of use for the waste. EoW status applies to a certain purpose of use and only waste materials intended for such use may cease to be waste on the basis of the criteria.388

The first criterion is interpreted in a slightly different manner in cases where it is applied in the regulation of EU or national level EoW regulation or where it is applied in case-by-case decision-making.388 In drafting general EU or national EoW regulations the purpose of use would have to assure the use of the EoW material in that purpose. Otherwise it would not cease to be waste. Therefore in general level regulation the criterion would provide that the purpose of use would not be marginal. The criterion in general regulation could be evaluated by reference to how established the purpose of use is in industrial production. After the EoW status has been regulated on, only materials going to that specific purpose of use may cease to be waste on basis of that decision. Naturally it is possible to rule on more than one suitable purpose of use for a single waste-based material in regards to its EoW status. The stability and degree of establishment of the purpose of use should be taken into account when assessing fulfilment of the criterion if the ruling aims to reach a high coverage of the waste stream (e.g. in EU or national level EoW).389 It would seem that the existence of different kinds of standards and using them in trade refers to the fulfilment of the first criterion.390 The details and level of precision of the applicable standards give a good indication of how specific the purpose of use is: materials traded on the basis of highly detailed standards are most likely destined for a specific purpose of use. In any event, it seems unlikely that EU-wide or national EoW legislation would be drafted to cover marginal uses of waste material. The same goes for waste materials that cannot be recovered in industrial practices in a profitable manner.


386 See de Sadeleer, Nicolas, ‘Scrap Metal Intended for Metal Production: The Thin Line between Waste and Products’, JEEPL 9 (2) 2012, p. 137, for the view that the EoW status of scrap metals has, besides environmental impacts, a significant impact on the economic independence of the EU.


388 Different levels of EoW decision-making are explained further in chapters 3.5 and 3.6.


The clearest indication of the criterion is that the purpose of use for the material is almost always the same. This is true for most scrap metals. However, there are waste streams that have at least one purpose of use viable for EoW processes but also have other possible purposes of use. The features of the waste material can differ a great deal but it seems that EoW legislation is possible if the purpose of use is somewhat similar and its environmental and human health effects can be considered similar. The features and consistency of the waste streams must be taken into account in evaluations of the purpose of use. The more homogeneous the waste stream, the more likely it is that a clear purpose of use can be found for it. On the flipside, it is less likely that a clear purpose of use can be found in relation to very heterogeneous waste material such as municipal solid waste (MSW) at least on a level that would incentivise general regulation on the EoW status. Other factors that should be taken into account in the evaluation of the first criteria are knowledge of use, the user’s acceptance of the waste-based substance, and social acceptance of the use. Availability issues, such as geographical distribution in the EU, and stability of generation should also be taken into account.

The case-by-case rulings of the EoW status the interpretation of the criterion is more relaxed. Due to fact that the recovery operation and the waste stream are usually more defined and the volume of waste is more limited, it only has to be shown that the waste taken into the facility goes into the specific purpose of use defined. In many cases it is enough to merely state the purpose of use in order to fulfill the criterion in case-by-case decision-making.

The original first criterion before the 2018 amendment of the WFD was that the object or substance is commonly used for specific purposes. The problem with original written version is that it required an assessment of whether purpose of use was common. Strict textual approach of the previous formulation could have led to a situation where a waste-based material with a clear purpose of use could not cease to be waste where the purpose of use would not exceed the threshold of ‘commonly used for specific purposes’. The commonness of the purpose of use was especially complicated to show in case-by-case decision-making. The new formulation of the criterion emphasises the teleological interpretation of the provision by mere focusing on the de facto purpose of use for the waste-based material instead of putting too

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392 See End-of-Waste Criteria for Waste Plastic for Conversion: Technical Proposals. Final Draft Report. European Union 2013, pp. 19–21, 162. For instance, the technical proposal for the EoW status of waste plastic notes that although there are thousands of different kinds of plastic that are not mixed in material re-use or recycling, by far the most common purpose of use is recycling of the polymers and producing new plastic products.

393 See End-of-Waste Criteria for Waste Paper: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011, p. 44. It is clear that the sources of waste have a significant effect on the homogeneity of the waste streams. As far as paper waste is concerned, it has been found, for example, that offices’ paper waste streams are extremely homogeneous and they are therefore very suitable for the same waste recovery operations.

much burden of proof on whether this purpose of use can be construed as common. The matter of commonness of the purpose of use is traceable to some extend in interpreting the criterion in relation to general EU level or national provisions on EoW. The amendment was mostly fine-tuning the original provision and should not totally offset the interpretation of the criterion.

3.3.3 A market or demand

The second criterion set out in Article 6 of the WFD is that a market or demand exists for the substance or object. As with the criterion of common purpose of use, this criterion aims to ensure the factual recovery of the substance or object and to prevent its disposal. The criterion of market or demand is tied to the purpose of use of the material: a market or demand for the product must exist for the specific purpose of use for which the EoW legislation is drafted. On the other hand, the purpose of use for the substance or object that is subject to EoW legislation is often one that is economically profitable and linked to developed markets.

Some waste-based products have had markets and have been recovered efficiently to serve in production processes for a long time. For example, waste-based glass cullet has had a functioning market for decades. While it is clear that well-established markets exist for certain kinds of waste product, it is possible to regulate the EoW status of substances or objects for which there are no established markets. The possibility of a market or demand for the product in question must be evaluated in order to assess the applicability of this criterion. An evaluation of the market situation must be presented when drafting the EoW legislation. This evaluation should cover the EU-wide or national development of the recycling market depending on the regulatory level of the EoW legislation.

The substance or object can fulfil the criterion of a market or demand by having at least one functioning market. The market can even be local if the criterion is evaluated for national EoW legislation. The main focus is on whether the market can use the waste material subject to the EoW legislation and thus ensure that it does not go to disposal operations. It should be noted that temporary storage for up to three years is possible before recovery operations begin. It is possible to lay down EU-


400 JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 6. See also Article 2(g) of the Landfill Directive and Recital 16 of the WFD. It has to be taken into account that temporary storage for up to three years is possible before recovery operations begin.
wide EoW legislation even in relation to a geographically restricted market when that market can use the waste material so that the EoW legislation is not used as a means of circumventing the legislation on waste disposal. Otherwise non-waste materials might be produced for an undetermined purpose of use and stored for uncertain future utilisation.

The second criterion can also be fulfilled without the market when there is sufficient demand for the substance or object. Such demand can also be taken into account where a market for the waste material exists. The demand for the product might complement the smaller markets and thus add up to a market comprehensive enough to fulfil the criterion of market and demand.\footnote{See End-of-Waste Criteria for Aluminum and Aluminum Alloy Scrap: Technical Proposals. JRC Scientific and Technical Reports. European Union 2010, pp. 15–17. The market for aluminum and demand for aluminum scrap has been on the rise during the last few years. Currently the demand on the aluminum markets exceeds production capacity.} This provides the legislator with the possibility to legislate in respect of substances or objects ceasing to be waste where no established market yet exists. This possibility should not be used in order to legislate in respect of waste material where there is no certainty of use. It merely extends the regulatory possibilities to subjects or objects the market for which is yet to develop.\footnote{Study on the selection of waste streams for End of Waste assessment: Final report. JRC Scientific and Technical Reports. European Union 2009, pp. 31–32.} The demand for the products might be completely dependent on the end product. This means that demand might exist for one use but there may be no demand for any other use of the product.

The price of the product and competition on the market have a great impact on the criterion of a market or demand.\footnote{See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, pp. 38–39.} The use of more expensive waste products often leads to more expensive end-products; while the use of cheaper waste products, such as compost and aggregates, lead to cheaper end-products. The potential demand or market for the waste material is highly dependent on the difference between the prices of the waste-based materials and the prices of pristine raw materials. The bigger the difference, the greater the demand, assuming that the quality of the waste material corresponds to a sufficient extent with that of the virgin raw material. These price differences are influenced by technologies and legislation guiding the use of waste-based substances and objects. The use of new technologies makes it easier and more profitable to utilise waste material, thus making the waste-based material option more attractive. Using waste-based products can also provide reputational benefit by allowing the operator to promote itself as an eco-operator, but the most effective rationale for effective market development of waste materials is that they cost less than virgin raw materials.

In addition to the pricing of the products, the availability of the waste clearly impacts upon its market and level of demand. Production is not possible without sufficient raw materials and is always limited by the amount of raw material stock available. A functioning market depends on the availability of the waste material, which can vary between Member States and areas. For example, the availability and utilisation of compost materials are purely dependent on the decisions made in the
relevant area or agricultural sector. The level of supply of recycled and secondary aggregates, which is too low to satisfy the need for this kind of waste material, offers another example. Both supply and availability have been high in respect of the subjects of the first EU-wide legislation on EoW (for aluminum and steel scrap and glass cullet).

There are many different reasons for availability problems. Transportation issues have a big impact on the availability of waste material. The shipment of waste has a smaller impact on the markets for the more expensive waste materials such as metal scrap than on those for cheap waste materials such as secondary aggregates. The biggest effects are felt in respect of the cheapest and heaviest waste products because they have the greatest transportation costs in comparison to the benefits gained in using them as substitutes for virgin raw materials. High transportation costs may even make it impossible for the product to establish itself on the market by making its use unprofitable. However, a cheap waste material may be an essential part of a valuable end product to the extent that this outweighs apparently uneconomically high transportation or shipment costs, thus allowing for a functioning market for the product. The main rule of the second criterion is that waste materials for which there is no market that can use the waste streams should not cease to be waste. Recycling markets that already function offer the clearest indication of the truth of this rule. The market should be stable enough to ensure that the waste does not end up in a disposal operation.

The lower price of waste-based materials often prompts operators to switch from virgin raw materials to waste-based ones. For example, the demand for scrap metal has increased continuously despite its varying quality. These markets have developed

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into efficient recycling markets. In relation to these wastes the recovery market was already established before the legislation on EoW came into existence. However, it is possible for a waste material to cease to be waste even when it does not substitute any virgin product per se. In those situations, it is clear that no established market necessarily exists. Some level of substitution is a feature of all EoW products since they have to undergo a recovery operation and the concept of recovery in waste legislation is based on substitution rate in a plant or in the wider economy.

Besides safeguarding the certainty of use of the material, the fulfilment of the second criterion also serves as a sort of assurance of the regulatory fitness of the provisions covering EoW. The effectiveness of the legislation on EoW is usually tied to its scope of application and, by requiring a market or demand, the criterion limits the scope of application to the waste streams that have the greatest potential to promote material efficiency and the circular economy.

3.3.4 The technical requirement for specific purpose and existing legislation

The third EoW criterion is that the substance or the object must fulfil the technical requirements for the specific purposes and meet the standards for products that are laid down in the existing legislation. The rationale behind this criterion is that the use of the material as non-waste must be lawful. When the material is still considered waste, waste legislation fully applies to it. After the material ceases to be waste, all the legislation regulating similar products applies to it in place of the waste legislation. The criterion also seeks to ensure that using the waste material does not require overly long processing.

In common with the other criteria, the criterion of technical requirements is bound to that of specific purpose. For example the legal provisions that apply in respect of waste paper when it is used in energy recovery differ from those that apply when it is used in material recovery operations. However, the properties of the waste material naturally also have a significant bearing on the legislation applicable to it, in addition to the processing methods used to produce the end product. The third criterion is linked to the fourth criterion of effects on the environment and on human health and both are to be taken into account when each is evaluated.

Problems may arise in respect of the criterion when mapping out the comprehensive legislative framework that applies to the product after it ceases to be waste. Certain problems may also result from norms that do not have official binding force but which may affect the actual legislative framework governing the product due their function in sales contracts and in the customary practices in a certain field of industry. The EU’s harmonised technical requirements, standards and product legislation reduce the

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scale of this problem since most of the legislation on products ceasing to be waste is already harmonised. The existence of this kind of ‘new’ legislative framework for EoW products is a necessary precondition for regulation of EoW status. The evaluation of the criterion can be divided into three parts: (1) the quality necessary for the purpose of use; (2) technical specifications for the product or material; and (3) compliance with the national and supranational legislation. Even though the rationale for the third criterion is to ensure the lawfulness of the use of the product, it also has a direct effect on the product’s markets and suitability for re-use or recycling.

The regulation of a product and the technical requirements that apply to it may be based on different kinds of limit values. These are simple to interpret and comprise either/or regulatory conditions that are always either fulfilled or not fulfilled and the distinction between the options is measurable. For example, Council Regulation (EU) No 333/2011/EU, which governs scrap metal ceasing to be waste, lays down clear maximum quantities of foreign substances that are allowable in the mass of the metal scrap. If the quantity of the foreign substance does not exceed the limit, it can cease to be waste. If not, then the metal scrap remains waste and is subject to the WFD and other waste legislation. Article 6(2) of the WFD provides for the possibility of these kinds of limiting values being laid down in legislation on EoW. This kind of accuracy may have to be sacrificed in EU legislation to ensure EU-wide consensus and implementation.

Different factors affect regulation of the product after it ceases to be waste. Private and public product standards may have a crucial impact on the applicable technical requirements. These standards may, for example, stipulate the quality, size or other features of the product and are to be taken into account when they have a practical effect on the characteristics and the use of the product, even when they have no official binding force. It may be necessary to fulfil the requirements laid down in standards of this kind to ensure sufficient demand for the waste-based product.

The purpose of the third criterion is to ensure the practical usability of the substance or object and that no adverse environmental and human health effects are caused by removing it from the ambit of waste legislation. For example, in respect of the use of compost, the question of which legislation applies depends on whether it is used as a fertiliser or as a growing media. Different solutions have led to a situation where

418 Study on the selection of waste streams for End of Waste assessment: Final report. JRC Scientific and Technical Reports. European Union 2009, p. 4. One option for widely interpreted and open standards and technical requirements is to legislate at a national rather than EU level due to special geographical characteristics etc.
compost materials are classified as waste in some Member States and fertilisers in other Member States. This means the scope of the legislation can be highly dependent on the uses of the waste material and the structure of national legislation on such issues. The linking of legislative frameworks should also be taken into account: a waste material used, for example, as a fertiliser must be able to produce agricultural product that can be marketed normally in Member States. For this reason, legislation indirectly connected with the waste material has to be taken into account. The legislation on the waste materials must be comprehensively examined before extending its application to subjects or objects ceasing to be waste.

The basic rule is that if a waste-based material fulfils the conditions applicable to its virgin counterpart, it fulfils the third EoW criterion. However, certain provisions only apply to waste-based materials, and these may lay down different quality norms or processes for the EoW products. For example, the waste materials could be secondary or recycled aggregates that fulfil the technical requirements established for construction aggregates in Regulation (EU) No 305/2011 of the European Parliament and of the Council. Greater difficulty may be encountered in fulfilling the criterion in respect of waste materials that require a great deal of processing before their use. In order to fulfil the EoW criteria the substance or object should require as little processing as possible to achieve the technical requirements and standards.

In the UK, national EoW rulings are made by reference to quality protocols. These set quality standards for waste material in relation to certain specified purposes of use. If the materials meet the standards set in the quality protocol, they may cease to be waste. Many of these quality protocols are based on material comparator documents that contain evaluations of the adequate level of substitutability between certain virgin raw materials and waste-based materials. To assist in the interpretation of the quality protocols and the EoW decisions, a series of 15 different reports on non-waste materials as comparators for waste-derived materials in EoW procedure have been published in the UK. These report discuss, for example, the chemical compounds acceptable in these kinds of non-waste and waste materials and the material properties that are relevant to the use of the substance and which should, therefore, be found

421 See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 92. The regulation of compost is mostly done on a national basis due to the unnecessarily large scale of EU legislation. The market and demand for compost is highly dependent on geographical conditions and the structure of the agricultural sector within the Member States. For instance, different soil, different climate conditions and different land use choices have a significant effect on the possibility to use compost material.

422 See Hukari, Sirja & Hermann, Ludwig & Närrorp, Anders, ‘From wastewater to fertilisers – Technical overview and critical review of European legislation governing phosphorus recycling’, *Science of the Total Environment* 542 (2016), pp. 1133–1134, for the point that the current EU legislation does not hinder nor actively supports better recovery of mineral phosphorus because the legal provisions governing the use of recovered fertilisers are not harmonised within the EU.


in both virgin and waste-derived substances and objects. It is not necessary for all of the same features to be found in the waste-based material that are found in its virgin counterpart. There is no need for waste materials that do not have a virgin counterpart to meet the same standards as the other substances or objects used instead of them but they should uphold the requirements necessary to ensure their safe use and compliance with national and EU legislation. However, in the UK reports on non-waste comparators have been produced for waste streams substituting virgin products.

3.3.5 Overall adverse environmental and human health impacts

The fourth criterion is that the use of the substance or object should not cause any adverse impacts on the environment or on human health. This means that material ceasing to be waste should have neutral or positive overall effects on the environment and on human health. The criterion can also be called the criterion of environmental acceptability. It functions as a safety valve to ensure a high level of protection of the environment and of human health when this cannot for some reason be achieved through the other applicable legislation under the third criterion. Filling the criterion requires an in-depth examination of the waste-based substance or object, the impacts of its use and life-cycle and the risks to the environment and to human health that these pose. This criterion aims to ensure that the use of the substance or object does not cause any impacts that would require it to be considered a waste and to be controlled under the framework of waste legislation.

All kinds of impacts must be taken into account in the assessment: e.g. greenhouse gas emissions, other aerial emissions, and risks involved in transportation and storage. The aim of the criterion is to obtain a comprehensive understanding of the impacts on the environment and on human health and the risks involved in using the waste-based material as non-waste. Direct impacts refer to all impacts that are inflicted directly by the waste product or its features, such as, for instance, impacts caused

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428 See Steenmans, Katrien, Enabling industrial symbiosis through regulations, policies, and property right, University of Surrey 2017, p. 170, for the point that this has not been explicitly referred to in the textual formulation of Article 6 WFD.

by the radioactivity of the waste material. Indirect environmental and human health impacts refer to a wider range of different impacts caused by something other than the direct impact of the waste material or its features. In order to provide the most comprehensive evaluation, all the possible risks and interactions of different substances and objects have to be taken into account.

The impact assessment must be based on natural scientific data. The importance of a geographically wide-ranging and comprehensive evaluation is emphasised with respect to the EU legislation on EoW. The assessment should also include transboundary environmental and human health impacts. In addition to the environmental impacts of material ceasing to be waste, all the health impacts of the changes in production and possible emissions are to be considered. Impacts on human health can either be caused directly by the waste material and its features, or indirectly, for example, because of a deterioration in environmental conditions. In addition to the adverse environmental and human health effects of materials ceasing to be waste, the positive impacts of the EoW procedure should be borne in mind in the evaluation. Such positive impacts are evaluated by comparing the no-action scenario with the potential impacts of EoW status. For example, while virgin materials must be shipped from far away, EoW materials are often produced near the venue of the recovery operation, which means that only a small amount of emissions are generated in their transportation. The direct and indirect impacts of the life-cycle of the product must be considered, including the positive impacts alongside the negative effects.

As with the other criteria, the criterion of environmental acceptability is bound to the specific purpose of use that has been determined: different purposes of use have different impacts. The quantity, quality and the emissions depend on whether the waste material is re-used, recycled or recovered for energy. The impacts of the material have to be controlled in a similar way before and after it has waste status. For some waste materials it is necessary to lay down environmental restrictions...
and limit values to ensure that they can be utilised in an environmentally friendly manner.\footnote{C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013, especially paras. 62–63. The CJEU observed in this case that environmental acceptability could be achieved through a special regulatory framework such as REACH.} Other wastes are safe to us as such. The final evaluation of the impacts should place emphasis on the impacts on ecosystems and human welfare as well as on the productivity and material efficiency\footnote{Evaluation of the profitability of the resources does not have a purely economic basis, since the increased productivity of the resources achieves considerable environmental benefits and promotes sustainable development and fulfilment of the principle of sustainable use.} of the waste-based resource.\footnote{JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, pp. 35–36.}

The substitution of waste-based materials for virgin raw materials reduces the demand for the latter and makes it possible to lighten the production process, thus prolonging the life-cycle of the waste material and reducing the need for and environmental and human health impacts of landfilling.\footnote{See End-of-Waste Criteria for Glass Cullet: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011, p. 60. Prolonging a product’s life-cycle and avoiding its disposal are important factors in increasing material efficiency. Nonetheless, these benefits are even more significant for waste streams such as glass cullet that are capable of retaining their physical features through an infinite number of recycling loops.} In addition, the popularity of waste substitutes may stem from the reduced cost of acquiring raw materials. For example, organising a recycling loop for scrap metals is cheaper than mining the minerals required. The production process frequently remains somewhat similar after the raw materials are substituted by waste-based materials, although use of waste-based materials often makes it possible to bypass certain production stages. It has been acknowledged in respect of many EoW pilot projects that the use of waste materials often achieves substantial energy savings. For example, producing products from scrap copper requires 35% to 85% of the energy used when virgin copper is used as the raw material in production.\footnote{End-of-Waste Criteria for Copper and Copper Alloy Scrap: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011, p. 41.} For aluminum products, this figure is as low as 7%, and for waste paper it is between 20% and 60%.\footnote{End-of-Waste Criteria for Aluminum and Aluminum Alloy Scrap: Technical Proposals. JRC Scientific and Technical Reports. European Union 2010, p. 20. The energy saving rate for aluminum does not cover the energy savings in production of bauxite, which are smaller. End-of-Waste Criteria for Waste Paper: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011, p. 44.}

In addition to changes in the impacts on the environment and on human health caused by production, the evaluation also takes into account that waste is no longer destined for disposal. This covers emissions from disposal operations and waste management and transportation impacts. For example, landfilling results in the loss of the material potential and energy capacity of the waste, which then causes greenhouse gas emissions as well as other environmental impacts. More efficient processes in terms of usage of materials help to reduce greenhouse gas emissions and other environmental impacts caused by waste by reducing the need for virgin raw materials and waste disposal operations.

In relation to the last criterion, the expertise of the user of the EoW material must be taken into account. As noted above, it has been made clear that an EoW product can pose certain environmental and human health risks, although if adequately controlled
these risks are not likely to materialise. Therefore, where the substance or object is used in a professional purpose of use, the user is expected to have a relatively high level of awareness of the properties of that substance or object and the precautions that need to be taken. It should be noted that most EoW products are used as raw materials in industrial processes before the consumer stage of the end-product. Special provisions on the necessary skillset of the handler and their training can be included in legislation on EoW.444

As is the case with by-products and their environmental acceptability, it is also difficult to carry out a comprehensive life-cycle analysis of the environmental impacts of waste ceasing to be waste.445 The key requirement seems to be the need to prove that waste-based material does not cause adverse impacts – for example, on the health of the users of the end-product – when it is used in a product. Most of the time the same production processes can be used for virgin raw material and waste-based materials alike, and these may be lighter in respect of the latter.

3.4 GENERAL GUIDELINES FOR THE INTERPRETATION OF THE CRITERIA

Both sets of criteria basically aim for the same thing: removing the bottlenecks to using waste-based materials for a clear purpose, achieving a high level of quality, and avoiding impacts on the environment or on human health. The interpretations of the criteria should emphasise this point in order to reach effet utile and the objectives (telos) of the regulation. It is crucial that no single criterion is evaluated in isolation, since each must be interpreted in such a way that fulfilment of one criterion supplements fulfilment of the others and vice versa.446 The textual approach of course has to be the starting point of the interpretation of the criteria but systematic and teleological approaches will have to be taken into account due to the fact that single criteria are not clearly defined: e.g. how big a market constitutes having a market for a substance or object in relation to the EoW criteria?

The criteria have multiple links, overlap, and are all based on the same objectives as set out in the waste legislation. It is possible to complement some of the criteria by fulfilling another criterion better. For example, meeting the criterion of technical requirements can help to establish a market for waste materials or at least ensure demand for them. This kind of coherence should prevail between the criteria: the criteria pursue a common objective and they should complement each other and regulation of the waste material so that the objectives can be achieved in a safe manner.

444 For example, this has been done in Articles 2 and 6 as well as in Annexes I and II of Regulation (EU) No 333/2011, which covers EoW status in respect of steel and steel alloy scrap.

445 See Zorbas, Antonis A., ‘Sustainable waste management through end-of-waste criteria development’, Environmental Science and Pollution Research (2016) 34, pp. 7378 – 7379: However, life-cycle assessment tools have been used in the evaluation of the criterion.

The first criterion aims to ensure that material excluded from the scope of waste will be used for a specific purpose. In order for a material to cease to be waste research must confirm a market and demand for it and a specific purpose of use must be identified. Furthermore, the first criterion for by-product status lays down a stricter provision relating to ensuring the use of the substance or object.\textsuperscript{447} In order to be classified as a by-product, the further use for the production residue must be certain, while in respect of EoW evaluation the existence of a market and demand are sufficient to assure the further utilisation of the material. EoW status does not, for example, require a contract between user and supplier, whereas by-product status may. Nevertheless, in many cases the by-products are used in the same process they were generated in. In the UK the case-law on EoW criteria indicates a requirement for there to be a genuine market for the material so that it will definitely be used.\textsuperscript{448} In this formulation the first criterion does not have a great deal of significance by itself but only in combination with the second criterion.

It would appear that, due to regulatory objectives, the criterion of environmental acceptability is the strictest of the criteria and that it requires that no adverse impacts on the environment or on human health must ever be produced in relation to exclusion of a substance or object from the scope of application of the waste legislation.\textsuperscript{449} The wording of the criteria is also clearer than the criteria regarding the certainty of materials use. Therefore, exclusion from the concept of waste is not possible if declassification will risk any such adverse impacts. However, in certain circumstances this risk can be adequately controlled through other legal provisions, monitoring and expertise. The interpretation of the criteria should be based on a life-cycle assessment and a holistic approach to the objectives of waste policy and the circular economy.\textsuperscript{450} Assessment of all impacts involved in the product’s life-cycle should be taken into consideration to avoid unexpected impacts on the environment and on human health.

\textsuperscript{447} See Zorpas 2016, p. 7377: Zorpas argues that EoW criteria reproduce that a waste has reached a phase of processing whereby it has essential value, so that it is unlikely to rejected as a waste. However, according to interpretation laid down earlier in this dissertation (chapter 3.3), it has to be concluded that the achievement of the criteria has to rather be based more on the showing the factual use of the waste material than its value.


\textsuperscript{449} See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, pp. 9, 17–18. The end result of the EoW procedure should, at minimum, have no further environmental and human health impacts than was the case prior to the regulation. However, it is advisable to draft EoW regulations so that positive environmental and human health impacts are achieved. See Turunen, Topi, ’Jäteluokittelusta poistumisen kriteerit ja niiden tulkinta’, Ympäristöjuridiikka 2/2014, pp. 54–55 (only available in Finnish).

\textsuperscript{450} See Dalhammar 2015, p. 101, for the point that while life-cycle assessment shall be based on scientific approach, there will always be need to rely on assumptions and set limitations when conducting the studies.
in later life-cycles. However, the distinction between waste and non-waste cannot be made purely on the basis of the level of protection involved. The process should always be based on the actual impacts of the legislation, and should involve taking a holistic approach, keeping in mind the objectives of the EU’s waste policy and carrying out a case-by-case assessment of the features of the waste stream in question. As discussed above, the wide interpretation given to the concept of waste and the control requirements set out in the waste legislation are largely based on the precautionary principle and on insufficient or unverified knowledge of the properties of the waste material and its impacts on the environment and on human health. Nevertheless, ceasing to be waste has direct implications in this regard and the criteria for ceasing to be waste address the problems connected with the regulatory control of waste materials.

The precautionary provisions laid down for the utilisation of waste reflect the precautionary principle. As discussed earlier in this dissertation the precautionary principle forms the basis of the wide interpretation given to the concept of waste by creating a preventative dimension to maintain a high level of protection against the many problems wastes pose to the environment and to human health. However, exclusions from the concept of waste address the situation where unnecessary control measures measures hinder the utilisation of waste materials and closing the loop. The use of exclusions from the concept of waste offers a means of promoting efficient use of materials and the circular economy by removing bottlenecks. If a substance or object is declassified as waste, it should be clear that the precautionary mechanisms contained in the waste legislation are no longer needed in order to ensure a high level of protection of the environment and of human health. This is ensured by the criteria concerning overall environmental and human health impacts in both the by-product and EoW criteria. The protection aspect within the regulatory framework is compulsory. The provisions that depart from the legal obligations set out in the waste legislation can promote the objectives of the circular economy by removing unwarranted precautionary mechanisms (or bottlenecks) and in this way enabling more efficient waste recovery. Provisions on high levels of environmental and human health impacts in by-products and EoW criteria are not necessarily needed if the material is classified as non-waste, as the precautionary principle no longer applies. Therefore, the assessment of the by-product and EoW criteria is lessened when a substance or object is declassified as waste.

451 The use of SBR granulates from waste tyres for artificial grass football fields is an example of unexpected impacts of recovered life-cycles. This common practice was questioned when it was found that the granulates might contain high polycyclic aromatic hydrocarbons (PAH) values that are harmful for human health. To avoid such problems, the environmental and human health impacts of waste should be thoroughly evaluated before their recovery and the necessary quality and emission control mechanisms should be put in place. However, in this particular case further research into the materials used proved that the concerns were unfounded. See https://echa.europa.eu/it/-/recycled-rubber-infill-causes-a-very-low-level-of-concern (last visited on 4 May 2017).


453 See http://www.environment-agency.gov.uk/business/sectors/124299.aspx (last visited on 15 January 2018); R (on the application of OSS Group Ltd) v Environment Agency (2007) EWCA Civ 611. In the UK the interpretation of EoW criteria should be based on: (1) the principles set out in the legislation on waste; and the WFD; and (3) the OSS test (as set out in the case of R (on application of OSS Group Ltd) v Environment Agency), which determines how well a certain waste-based material is converted into a marketable product, how well it matches the features of the virgin raw material, and whether it causes adverse environmental effects. This kind of approach may work in line with the existing EoW criteria contained in the WFD.

454 See Koch & Reese 2005, p. 442, who found it peculiar that prior to the enactment of the current WFD the CJEU had not considered whether a high level of environmental protection could be accomplished outside the waste-law instruments.
health impacts are directly provided for in both the by-product and the EoW criteria. Therefore, it is clear that in order to remove the bottlenecks the impacts can either be neutral or, preferably, positive.

In addition to the criteria for environmental acceptability, knowledge based on scientific data is important in relation to fulfilling the criteria for legal requirements and production standards. In order to ensure a level playing field between the utilisation of waste-based materials and of virgin raw material, waste-based material should, where possible, meet the same standards that are set for its non-waste counterpart. The level playing field could also be promoted through BREF’s in order to provide common standards for EU recovery markets and to avoid the ‘race to bottom’ in which environmentally less ambitious Member States could attract recycling operators with less stringent control measures. In this regard, the provisions on substances and objects should be based on their impacts and usability where such information is available. However, this should not lead to a situation where waste materials are regulated either more or less restrictively than virgin raw materials.

If an adequate level (neutral or positive impacts) of protection of the environment and of human health is reached, the rationale behind the additional control measures is removed. Providing a level playing field for waste-based and virgin materials then ensures removal of the bottlenecks impeding recovery since no factually different impacts on the level of protection are in play. The provisions from the concept of waste also function as a form of quality insurance and indicate that sufficient information on the properties of, and possible risks posed by, the waste material is available. Where this is the case, the control measures of the waste legislation are no longer necessary.

An adequate level of protection can be achieved by applying the quality standards set out in the provisions on exclusion from the concept of waste instead of applying the precautionary control mechanism contained in the waste legislation. Precautionary control is aimed solely at situations where there is no scientific certainty as to the risks. A contrario, where there is scientific certainty as to safe utilisation these measures are unwarranted. Precautionary control is based on situations where the waste has unknown properties and the quality and the uses of the waste material

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455 This is also required in the strict textual approach to by-product and EoW criteria.

456 Van Calster & Reins 2015, p. 268.

457 As noted above, this assessment is rather complicated and should probably focus on the potential problems involved in using waste instead of virgin raw materials to determine the purpose of use.

458 See C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142, especially paras. 60–64; Alaranta & Turunen 2017, pp. 169–170, for the observation that in Lapin luonnonsuojelupiiri it was concluded that REACH registration data could be used in order to decide whether the use of a substance or object will ‘lead to overall adverse environmental or human health impacts’ as required by the fourth EoW criterion. Thus, the material at issue in the case could cease to fall under the widely applied concept of waste and the additional control measures of the waste legislation since it could be sufficiently regulated under different legal provisions than those on waste. See also Turunen, Topi, ‘Deconstructing the Bottlenecks Caused by Waste Legislation: The End-of-Waste Regulation’, JEEPL 14 (2) 2017, pp. 186–207.

459 See de Sadeleer, Nicolas, EU Environmental Law and the Internal Market, Oxford University Press 2014, pp. 78–79.

could be addressed in provisions covering the requirements for its non-waste status and the applicable product regulation post-waste.\footnote{461}{This kind of reverse logic as regards the precautionary principle was applied in C-127/02 Waddensee (2004) ECR I-07405. See Dorman, Peter, ‘Evolving knowledge and the precautionary principle’, \textit{Ecological Economics} 5 (2005), pp. 169–176, 170–172.}

If it has been proven that the utilisation of waste causes no adverse impacts on the environment or on human health, the concept of waste should not be given a wide interpretation. In order to verify the nature of the impacts on the environment and on human health, it is important that the assessment of these impacts is based on relevant scientific knowledge. Furthermore, where necessary, a control system to monitor these impacts and the quality of the material should be established in order to verify the non-waste status. The exclusions from the scope of application of the concept of waste do not aim at totally offsetting the emission and quality control of waste materials but seek to create a level playing field between waste-based and virgin raw materials. Unknown waste streams can never, therefore, cease to be waste and unknown residual materials can never be classified as by-products. The point is that knowledge of the specific properties of the residual material assists in the recognition of the essential environmental and human health impacts connected with the use of such substances and specific provisions can be drafted to address just those impacts without at same time creating additional burdens for their efficient utilisation.

\section{3.5 EU LEVEL REGULATION ON THE EXCLUSIONS}

\subsection{3.5.1 Introduction to examination procedure}

Article 5(2) of the WFD lays down the provisions on regulating on by-product status on a general level. It states that.

The Commission may adopt implementing acts in order to establish detailed criteria on the uniform application of the conditions laid down in paragraph 1 to specific substances or objects.

Those detailed criteria shall ensure a high level of protection of the environment and human health and facilitate the prudent and rational utilisation of natural resources.

Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 39(2). When adopting those implementing acts, the Commission shall take as a starting point the most stringent and environmentally protective of any criteria adopted by Member States in accordance with paragraph 3 of this Article and shall prioritise replicable practices of industrial symbiosis in the development of the detailed criteria.

Article 6(2) of the WFD states the following:

The Commission shall monitor the development of national end-of-waste criteria in Member States, and assess the need to develop Union-wide criteria on this basis. To that end, and where appropriate, the Commission shall adopt implementing acts
in order to establish detailed criteria on the uniform application of the conditions laid down in paragraph 1 to certain types of waste.

Those detailed criteria shall ensure a high level of protection of the environment and human health and facilitate the prudent and rational utilisation of natural resources. They shall include:

(a) permissible waste input material for the recovery operation;
(b) allowed treatment processes and techniques;
(c) quality criteria for end-of-waste materials resulting from the recovery operation in line with the applicable product standards, including limit values for pollutants where necessary;
(d) requirements for management systems to demonstrate compliance with the end-of-waste criteria, including for quality control and self-monitoring, and accreditation, where appropriate; and
(e) a requirement for a statement of conformity.

Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 39(2).

When adopting those implementing acts, the Commission shall take account of the relevant criteria established by Member States in accordance with paragraph 3 and shall take as a starting point the most stringent and environmentally protective of those criteria.

According to the provisions, the EU level by-product and EoW regulation are carried out through the procedure of Article 39 of the WFD. Article 39 regulates on the committee procedure in the following way:

The Commission shall be assisted by a committee. That committee shall be a committee within the meaning of Regulation (EU) No 182/2011 of the European Parliament and of the Council.

Where reference is made to this paragraph, Article 5 of Regulation (EU) No 182/2011 shall apply.

Where the committee delivers no opinion, the Commission shall not adopt the draft implementing act and the third subparagraph of Article 5(4) of Regulation (EU) No 182/2011 shall apply.

Article 5 of the Regulation (EU) No 182/2011462 regulates on an examination procedure that is used in the EU level provisions of exclusions from the concept of waste. Examination procedure proceeds in the following way: first the Commission drafts a proposal on general provisions on a material being classified as by-product or ceasing as waste. The proposals of the current EU wide regulations were initially examined by the JRC that took into account the technical properties and the impacts of the waste streams. The new proposals are sent to examination procedure where the committee shall form a qualified majority on their view on the proposal. The votes of the representatives of the Member States within the committee shall be weighted

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in the manner set out in the Council of European Union. The committees comprise officials from the Commission and the ministries of Member States, together with members of national governments and parliaments. The committee is chaired by the Commission.

The qualified majority of the committee may deliver a positive or a negative decision on the draft. If the committee cannot reach qualified majority, no opinion on the proposal is delivered. Where the committee delivers a positive opinion, the Commission shall adopt the proposal and where the committee delivers a negative opinion, the Commission shall not adopt the draft implementing act. However in relation to the negative opinion, where an implementing act is deemed to be necessary, the chair of the committee may either submit an amended version of the draft implementing act to the same committee within 2 months of delivery of the negative opinion, or submit the draft implementing act within 1 month of such delivery to the appeal committee for further deliberation.

Where no opinion is delivered, the Commission may adopt the proposal, except in the cases where the act concerns taxation, financial services, the protection of the health or safety of humans, animals or plants, or definitive multilateral safeguard measures, the basic act provides that the draft implementing act may not be adopted where no opinion is delivered or a simple majority of the component members of the committee opposes it. Where an implementing act is deemed to be necessary, the chair may either submit an amended version of that act to the same committee within 2 months of the vote, or submit the draft implementing act within 1 month of the vote to the appeal committee for further deliberation. Where the Commission does not adopt the draft implementing act, the chair may submit to the committee an amended version thereof.

Article 6 of the Regulation regulates on the appeal committee. According to the provision the appeal committee also votes on the proposal and uses the qualified majority voting just like examination committees. Until an opinion is delivered, any member of the appeal committee may suggest amendments to the draft implementing act and the chair may decide whether or not to modify it. The chair of the appeal committee shall then endeavour to find solutions which command the widest possible support within the appeal committee. The chair shall inform the appeal committee of the manner in which the discussions and suggestions for amendments have been taken into account, in particular as regards suggestions for amendments which have been largely supported within the appeal committee. If the appeal committee delivers a positive opinion, the Commission shall adopt the proposed act. Where no opinion is delivered, the Commission may also adopt the draft implementing act. But where the appeal committee delivers a negative opinion, the Commission is prohibited to adopt the draft implementing act.

Before the 2018 amendment to the WFD the EU level regulation on by-product and EoW status were enacted in the so-called comitology procedure that somewhat resembles the current examination procedure. Although intended as an executive measure, the comitology procedure was considered problematic in terms of democracy within the EU’s decision-making processes because it often resembled a legislative

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measure. Szájer’s report especially focused on the European Parliament’s restricted possibilities to influence decision-making within the comitology procedure. The regulatory frameworks for by-product and EoW regulations made reference to the comitology procedure set out in Council Decision 1999/468/EC. Exclusions from the concept of waste were provided for in the legislation that specifies the content of the parent regulation (in this case, Articles 5 and 6 of the WFD, which lay down the criteria for by-product status or ceasing to be waste) with the help of technical data. Similar idea of parent regulation status of the criteria of Articles 5 and 6 of the WFD still remains in the examination procedure. The parent regulation should create clear limits as to the scope of the delegated regulation.

In comitology the committees commented and voted on executive acts proposed by the Commission and final decision-making occurred on the basis of voting where the same vote counts are used as in the voting of the Council in a similar ways as is regulated in the examination procedure. Comitology aimed to govern the Commission’s discretion in terms of the use of executive measures. In the comitology the European Parliament and Council had a special position where they could resist the proposed acts if they were unlawful, or in the case of negative and no opinion, if they wanted they could veto the proposals.

The comitology has often been criticised as the assignment of committees, their course of action and overall procedure was unclear and non-transparent. The comitology procedure also took place outside direct administrative control and was not therefore subject to the external pressure that is brought to bear in relation to normal legislative measures, because the proposed regulations were drafted by the JRC. The comitology aimed to meet the need for technical data in drafting legislation. The advantages of the comitology as well as the examination procedure are their flexibility and the possibility it offers to make rapid decisions. The use of this kind of measures also creates the opportunity to proceed with the harmonisation of EU

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465 See Report on legislative delegation (2010/2021(INI)).
467 Parent regulation refers to legal provisions that provide the basis for lower level regulation and the possibility of using the procedure. The relevant provision for EoW issues is Article 6 of the WFD.
469 See Lee 2014, pp. 38–39; Chalmers & Davies & Monti 2014, p. 147
472 Héritier et al. 2013, pp. 64–65.
law at a later date by means of technical specifications in matters where that kind of expertise is necessary.\textsuperscript{473}

The comitology procedure also has received criticism because if the framework of the parent regulation was too open, technical measures that ought to be executive start to resemble legislative measures.\textsuperscript{474} Control of procedure had been emphasised especially in relation to regulatory committees with scrutiny.\textsuperscript{475}

The technical regulation of comitology and examination procedure can be seen from two different perspectives: first it is a way for Member States to monitor the Commission’s executive measures;\textsuperscript{476} and second it is an excellent forum in which to discuss how to achieve the objectives of the legislation in the best and most efficient way.\textsuperscript{477} In respect of the subject area under consideration, there offer the opportunity to discuss the challenges involved in planning and drafting the EU’s waste legislation, the development of the circular economy and special features of the waste management of different Member States.\textsuperscript{478}

\subsection*{3.5.2 Technical regulation on ceasing to be waste}

Regulating exclusions from the concept of waste at EU level provides an excellent opportunity to promote common interpretations within the EU’s internal market. Even though there is a possibility to regulate on by-product status on the EU level, no by-product regulations have been enacted. The lack of regulation on respect of by-product status probably results from the fact that a rather large number of by-product rulings have been made on a case-by-case basis in relation to individual administrative decisions (e.g. environmental permits). Moreover, assessing the production residue status of materials requires detailed information on the production process.

EU-wide EoW criteria have been laid down for two reasons: (1) to create a better functioning market for waste-based substances and objects to provide economic and environmental benefits; and (2) to create coherent EU-wide rules for the quality and the impacts of using these waste-based materials.\textsuperscript{479} The JRC drafts the technical proposals for regulations before the actual examination procedure (the existing regulations have

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\begin{itemize}
\item \textsuperscript{473} Barnard, Catherine, \textit{The Substantive Law of the EU: The Four Freedoms}, Oxford University Press, 4\textsuperscript{th} edition 2013, p. 628. See C-154–155/04 Alliance for National Health (2005) ECR I-06451, para. 78. The CJEU highlighted the efficiency and flexibility of comitology in this case.

\item \textsuperscript{474} See C-50/00 \textit{Unión de Pequeños Agricultores} (2002) ECR I-6677 para. 38. Schütze, Robert, \textit{European Constitutional Law}, Cambridge University Press 2012, p. 230. The control mechanisms available in respect of comitology procedures were generally viewed as adequate when comitology does not overstep the limits of executive powers.


\item Pollack 2005, p. 44.


\item \textsuperscript{479} de Sadeleer 2012, pp. 139–141.
\end{itemize}
been enacted through comitology) where the members of the committee vote on the proposal.\textsuperscript{480} This is supposed to ensure that the technical draft proposal is as neutral among Member States as possible. However, Member States can pursue their national interests in the voting of the committee even though Member States are represented by their own experts in the regulated field.\textsuperscript{481}

At EU level, the following EoW regulations have entered into force through comitology: Council Regulation (EU) No 333/2011\textsuperscript{482} (steel and aluminum scrap), Commission Regulation (EU) No 1179/2012\textsuperscript{483} (glass cullet), and Commission Regulation (EU) No 715/2013\textsuperscript{484} (copper scrap). These three EoW regulations were dealt with by two different regulatory committees with scrutiny: CMTD (2010) 0880\textsuperscript{485} discussed the EoW possibilities of scrap metal and CMTD (2012) 0716\textsuperscript{486} discussed the EoW possibilities of glass cullet, copper scrap and waste paper. The first of these committees also discussed other waste streams and their EoW potential in addition to the scrap metal waste streams. The EoW regulation for energy recovery was not supported in the committee. The committee gave no opinion on the proposed scrap metal regulation but since it was not objected to in the Council or Parliament, it passed and entered into force.\textsuperscript{487}

The committee that dealt with copper scrap and glass cullet also discussed the EoW regulation for waste paper. The committee gave a positive opinion on the proposal for the EoW status of glass cullet. No opinion was given on the proposed EoW regulations on paper and copper so both proposals faced the threat of being vetoed by the Council or the European Parliament. The proposal concerning copper scrap was not objected to and entered into force. Nonetheless the draft proposal on the EoW regulation for paper was vetoed by the European Parliament and therefore never entered into force.\textsuperscript{488}


\textsuperscript{481} See C-57/72 Westzucker (1973) ECR 321, para. 17.


\textsuperscript{486} CMTD (2012) 0716: the Committee for the adaptation to scientific and technical progress and implementation of Directive 2008/98/EC on waste.

\textsuperscript{487} European Parliament: Plenary session, 18.10.2013, pp. 1–5. The decision to use the Parliament’ right of veto was based on the concern that differences between the qualities of the waste paper would give rise to adverse environmental and human health impacts.

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After that it seems that the Commission lost its appetite for EU-wide end-of-waste regulation.489

3.5.3 End-of-waste for fertiliser products

The EU proposal on the new fertiliser product legislation establishes the EoW status for biowaste-based fertiliser products outside the examination procedure or comitology. The objectives of the revised proposal are linked especially to recycling of nutrients when using bio-waste-based fertiliser products and addressing the environmental problems caused by the current regulatory framework on fertilisers.490 The regulation creates a new category of CE (Conformité Européenne) marked fertiliser products. Article 18 of the proposed regulation on CE marked fertiliser products provides that a CE marked fertilising product that has undergone a recovery operation and complies with the requirements laid down in this Regulation shall be considered to comply with the conditions laid down in Article 6(1) of Directive 2008/98/EC and shall, therefore, be considered as having ceased to be waste.491 In this case, the CE marking of the fertiliser product is considered sufficient proof that the EoW criteria set out in Article 6 of the WFD are fulfilled. The justification for this is that there is a specific purpose and a market, it fulfils the necessary legal requirements and applicable standards (CE standards for fertilisers), and the fulfilment of these standards ensures that its use does not cause adverse environmental or human health impacts compared to using non-bio-waste-based CE marked fertiliser products. This solution should not be understood as laying down a general rule that CE marking approval amounts to sufficient proof on which to obtain exclusion from the scope of the concept of waste as the requirements of CE marking often do not include extensive provisions on the impact of the substance or object on the environment or on human health. Many CE market products are also considered waste.

489 See Stengler, Ella, ‘Waste-to-Energy in the Circular Economy and the Energy Union’, OGEI 14 (3) 2016, www.ogel.org, p. 8. See also ‘Delivering the Circular Economy: A Toolkit for Policy Makers’, Ellen MacArthur Foundation 2015, p. 15, for the view that the fact that the Commission is losing its appetite for creating new EU-level EoW regulation is somewhat troubling considering that many of value chains connected with the efficient utilisation of waste extend across the borders of Member States and even the EU.


3.6 OTHER POSSIBILITIES TO REGULATE EXCLUSIONS FROM THE CONCEPT OF WASTE

3.6.1 National regulation

Article 6(3) of the WFD provides that decisions may be made at national level on EoW status where criteria have not been set at EU level.\footnote{See Kalimo 2006, pp. 632–635, for the point that this kind of shift from the centralised ‘command and control’ regulation to more decentralised ‘command and covenant’ is typical for second generation environmental legislation.} The Article states the following:

Where criteria have not been set at Union level under paragraph 2, Member States may establish detailed criteria on the application of the conditions laid down in paragraph 1 to certain types of waste. Those detailed criteria shall take into account any possible adverse environmental and human health impacts of the substance or object and shall satisfy the requirements laid down in points (a) to (e) of paragraph 2. Member States shall notify the Commission of those criteria in accordance with Directive (EU) 2015/1535 where so required by that Directive.

Due to the small number of EU legal acts on this topic the regulatory space for national legislators remains vast. In accordance with Directive 2015/1535/EU\footnote{Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (OJ L 241, 17.9.2015, p. 1).}, Member States must notify the Commission of these regulations. National EoW regulation is a second way to implement the objectives of the WFD and is supposed to be based on technical specifications in the same way as the EoW regulations that are drafted and accepted on the basis of the examination procedure.\footnote{See Scott, J. & Holder, J., ‘Law and New Environmental Governance in the European Union’, in de Búrca, G. & Scott, J. (eds.), Law and New Governance in the EU and the US, Hart Publishing 2006, p. 225.} There is no explicit mandate in EU legislation for national regulation of by-product status but such regulation has been implemented in the national legislation of some Member States\footnote{E.g. Finland.} and there are no explicit prohibitions against it.\footnote{See European Commission: Guidance on the interpretation of key provisions of Directive 2008/98/EC on waste, p. 21.}

National EoW regulations require that the substance or object can cease to be waste when it has undergone a recovery process, including a recycling operation, and complies with specific criteria to be developed in accordance with the following conditions: (1) the substance or object is commonly used for specific purposes on a national scale; (2) a national market or demand exists for such a substance or object; (3) the substance or object fulfils the national and EU technical requirements for the specific purposes and meets the existing legislation (national as well as EU) and standards applicable to products and (4) the use of the substance or object will not lead to overall adverse environmental or human health impacts. The criterion of environmental acceptability is not evaluated at national level and all the environmental and human health impacts should be taken into account. The logic of the above also
applies to any potential national regulation of by-products. However, because by-product status requires greater certainty of use and applicants have to give greater detail on the production processes for by-products, national by-product regulations should be quite strictly formulated. The decisions on by-product status issued to date have mostly been made on a case-by-case basis.

The EU-wide scheme on exclusions from the concept of waste provides for the possibility of setting specific requirements on the attributes of the regulation and the use of specific technical requirements as well as clarifying the position of the material in the internal market. Although legal instruments at national level also regulate similar properties of the substance or object, they cannot influence its position in the internal market. A national legal instrument will seek to achieve the same objectives as is the case at EU level but its geographical scope will be limited to the Member State in question. There are some advantages to such split level regulation, as well as certain limitations. The principle of subsidiarity would suggest that in many cases national legal instruments are to be preferred, notwithstanding the fact that this approach means smaller scale environmental impact and no impact on the internal market.

EU regulations apply in all Member States while national regulations only apply in the Member State in question. In addition, as mentioned above, evaluation of the criteria is carried out at national level in respect of a national regulation and at EU level in respect of an EU regulation. This opens up the possibility for Member States to regulate waste streams for which there is no demand or adequate markets at EU level or which are not on the EU’s priority list for future regulation. National regulation allows Member States to take into account and emphasise national special features. For instance, if less common waste streams or waste treatment techniques exist at national level, it may be better for these to be addressed in national legal instruments that can be carefully tailored to reflect such specialties in terms of waste management etc.

The advantages of national regulation are based on the possibility of removing from the definition of waste substances and objects that are in common use at national level. In respect of regulation at EU level, larger Member States may use their power to dictate the voting in the examination procedure so that numerous compromises need to be made in order to obtain a draft that will pass the vote. Such power

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498 Velzeboer, I. & van Zomeren, A., End of Waste criteria for inert aggregates in member states, ECN 2017, pp. 23–25. In May 2017 only 10 Member States have taken advantage of the possibility of national EoW regulation. Only Austria, France and United Kingdom have regulated on five or more different waste streams.

499 See Lee 2014, p. 90.

500 See Milio, Simona, From Policy to Implementation in the European Union: the Challenge of a Multi-level Governance System, I.B. Tauris Publishers 2010, pp. 8–9. The problem of unwillingness to implement EU objectives in national law could be reduced by means of legislation such as EoW regulations in respect of which Member States also receive financial incentives to implement EU waste policy objectives through the use of better legal tools to achieve efficient waste recovery. See also Schön-Quinlivan, Emmanuelle, ‘The European Commission’, in Jordan, Andrew & Adelle, Camilla (eds.), Environmental Policy in the EU: Actors, Institutions and Processes, Earthscan 2013, pp. 107–108.

can also be used to circumvent the EU’s institutional passivity. It is impossible to take local differences in waste management or industrial practices into account in the context of an EU-wide process. The political problems of the EU regulation have the biggest impact on small Member States that, for example, have climatic conditions that deviate from the norm and/or waste streams in respect of which there are only limited recovery capacities. National regulation can be an effective incentive for more efficient recovery from waste streams commonly used in certain Member States. National EoW regulations can act as an instrument to achieve the re-use and recycling targets contained in Article 11 of the WFD. The possibility for national regulations can be considered a context in which national actions support the improvement of the industrial symbiosis between the state and private actors by promoting economic and environmental benefits hand-in-hand.502 The significance of the possibility to regulate at national level is emphasises the principle of subsidiarity in the EU.

The current amended WFD contains a more specific regulatory framework for national regulatory measures on EoW status than the original version of the WFD. The Articles 6(2) and 6(3) provides that national EoW regulation should be carried out in accordance with the same defined framework as EU-wide EoW regulation under Article 6(1). The Article 6(2) states that EoW regulations shall include provisions on the following: (1) permissible waste input material for the recovery operation;503 (2) allowed treatment processes and techniques for said input material; (3) quality criteria for EoW materials resulting from the recovery operation in line with the applicable product standards including limit values for pollutants where necessary; (4) requirements for quality management, self-monitoring and accreditation, where appropriate; and (5) a requirement for a statement of conformity. This amended version reduces the leeway for national regulators in terms of formulating national regulations for EoW. However, the proposed regulatory framework adds a new emphasis on national regulation and case-by-case decision-making, while the previous regulation mostly referred to EoW in terms of EU level regulation.504

The Finnish Environment Institute (SYKE) examined the preconditions for national EoW regulation in its report on the benefits and shortcomings of the regulation on declassification as waste. The following preconditions were laid down: (1) there is no overlap with the EU level regulation on the same waste stream ceasing to be waste; (2) the waste stream fulfils the criteria for EoW status; (3) the regulation promotes the waste hierarchy set out in Article 4 of the WFD; (4) the regulation significantly reduces the regulatory burden involved in utilising the waste stream; (5) the costs of drafting and implementing the regulation are in balance with the reduction of regulatory burden and other benefits of the regulation, such as promoting the waste hierarchy; and (6) there are no negative side-effects deriving from the regulation.

503 See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 20, for the point that the regulation may be, but does not have to be, tied to a certain source of waste.
Some of the preconditions derive directly from legislation and others ensure that the regulation serves its original purpose, thus fulfilling ‘better regulation’ strategies.\(^{505}\)

### 3.6.2 Case-by-case decisions on non-waste status

Substances and objects may be excluded from the concept of waste on the basis of case-by-case evaluation.\(^{506}\) The criteria set out in Articles 5 and 6 of the WFD are a legacy of the CJEU’s case-law on the concept of waste and the exclusions from it. The possibility of making EoW decisions on substances and objects on a case-by-case basis was confirmed in *Lapin luonnonsuojelupiiri* and codified in the text of the WFD after the amendment.\(^{507}\) The exclusion of materials from the concept of waste could occur for example in an individual case in relation to environmental permit decision-making.\(^{508}\) Article 6(4) of the WFD regulates on the case-by-case decision-making in the following way:

Where criteria have not been set at either Union or national level under paragraph 2 or 3, respectively, a Member State may decide on a case-by-case basis, or take appropriate measures to verify, that certain waste has ceased to be waste on the basis of the conditions laid down in paragraph 1 and, where necessary, reflecting the requirements laid down in points (a) to (e) of paragraph 2, and taking into account limit values for pollutants and any possible adverse environmental and human health impacts. Such case-by-case decisions are not required to be notified to the Commission in accordance with Directive (EU) 2015/1535.

Member States may make information about case-by-case decisions and about the results of verification by competent authorities publicly available by electronic means.

It was stated in *Lapin luonnonsuojelupiiri* that case-by-case decision-making should be based on the facts of the case at hand and a ruling that such decisions should be based on the criteria set out in Article 6 of the WFD was deliberately avoided.\(^{509}\) The current legislative framework, after the amendment, however, directly refers to these criteria in relation to case-by-case decision-making.\(^{510}\) This should not be understood as a paradigm shift because the criteria set out in Article 6 of the WFD essentially

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\(^{505}\) Kauppila, Jussi et al., ‘Jätteeksi luokittelusta poistavan sääntelyn hyödyt ja haitat’, Ympäristöministeriön raportit 9/2018 pp. 81–85 (Only available in Finnish. However short versions of the preconditions are set out in the English abstract.).


\(^{507}\) C-358/11 *Lapin luonnonsuojelupiiri*, ECLI:EU:C:2013:142.

\(^{508}\) In the Flemish region of Belgium decisions on waste status and ceasing to be waste are made within a specific procedure, in which the Flemish regional authority on waste management and soil remediation (OVAM) decides whether the materials can cease to be waste.

\(^{509}\) C-358/11 *Lapin luonnonsuojelupiiri*, ECLI:EU:C:2013:142. The CJEU argued that the important question was whether the recovery operation had transformed the waste into a ‘usable product’.

reflect the conclusions reached in the applicable case-law. Case-by-case evaluation involves interpretation of the criteria for non-waste status, which is carried out in a different manner than in drafting general regulation on EU or national level on the declassification as waste. For example, in a case-by-case evaluation of EoW status the purpose of the use does not have to be common on EU or even national level, or the market does not have to cover the whole EU or the Member State. The two first criteria should merely ensure the purpose of use of the waste-based materials. This also applies for EoW decisions made on a case-by-case basis, even though it is unreasonable to expect an established functioning market for an individual instance of the use of a specific waste in a specific way.

It is crucial that rulings on the waste status are univocal and the waste status of same materials is not interpreted differently on a case-by-case basis if this is not justified on the basis of the criteria set out in Article 5 or 6 of the WFD. EoW decisions made on a case-by-case basis do not provide legal certainty in the widest sense on the classification of the material, which is one of the main features of comprehensive EoW legislation. The problematic factor in relation to case-by-case decisions is that they make it hard to ensure uniform interpretation of the criteria. Nonetheless, decisions on exclusion from the concept of waste made on a case-by-case basis can provide important incentives for new innovations in waste recovery and their position is highlighted in the amended version of WFD where case-by-case decisions-making on EoW then compared to the original WFD where case-by-case decisions-making on EoW was not even explicitly mentioned. The case-by-case decision making challenges the traditional top-down regulation and hence enables communication and learning-based development in by-product and EoW decisions unlike the EU or national level regulation.

511 A clear systematic approach is taken here in the interpretation of waste and non-waste.

512 The amended version of Article 6(4) of the WFD extends the procedural possibilities for case-by-case EoW rulings by stating that ‘Member State may decide on a case by case basis or take appropriate measures to verify, that certain waste has ceased to be waste’. The explicit mentioning of verification systems alongside the case-by-case decision-making can have substantial impacts in the nature of EoW decision-making.

3.7 END-OF-WASTE AND HAZARDOUS WASTE

The provisions on by-product and EoW status also apply to hazardous wastes. However, it should be specified that by-product status cannot per se apply to hazardous ‘wastes’ but can apply to production residues that would be classified as hazardous wastes if they were discarded. Waste materials that carry explicit risks of harm to the environment or to human health clearly require more control and monitoring. However, hazardous waste material can be used in recovery operations despite their hazardous elements. For the most part, the same rules apply to hazardous waste as to non-hazardous waste except for certain special provisions concerning the former. Hazardous waste status is the clearest indication of environmental and human health risks in waste management. However, the environmental acceptability criterion for non-waste status can be met in two ways: the material is safe to use, or the material and its properties can be adequately controlled outside the ambit of the waste legislation. In relation to hazardous wastes the important issues are those that concern the assessment of the control methods and the factual impacts of such wastes when regulated under product legislation.

In Lapin luonnonsuojelupiiri, the CJEU examined the possibility of EoW status for CCA-treated (a solution of copper, chromium and arsenic) old telecommunication poles used as underlays for duckboards along a hiking trail in a nature reserve that was partly classified as a Natura 2000 site. The Finnish Supreme Administrative Court asked the CJEU if being classified as hazardous waste automatically meant that the use of that substance or object would result in adverse environmental or human health impacts with reference to the fourth limb of the EoW criteria set out in Article 6 of the

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514 The relation between general national EoW regulation and case-by-case decision-making will be further analysed in the ruling of C-60/2018. See Request for a preliminary ruling in C-60/2018 Tallinna Vesi.

WFD. The Court also asked whether hazardous wastes could ever cease to be waste due their hazardous properties.516

The CJEU answered the latter question to the effect that EU law did not, at least in principle, exclude the possibility of hazardous wastes ceasing to be waste.517 As with non-hazardous wastes, hazardous wastes could also cease to be waste and be considered as products again after recovery. Once a hazardous waste is no longer waste, the legislation on waste stops applying to the substance or object and the regulatory framework governing similar products starts applying to it. In the case of CCA-treated wood, the most important element of that framework was REACH. As the fourth EoW criteria, in essence, assesses the situations before and after the substance ceasing to be waste, the main question would be that of whether REACH or another regulation could, in the case of CCA wood, control the hazardous properties of the waste material in the same way as the regulatory framework governing hazardous waste.518 REACH can ‘come to the rescue’ when the EoW status519 of hazardous wastes is under consideration, as REACH regulates similar subjects and properties as those that are deemed hazardous under the waste legislation.520 In this situation REACH provides the necessary scientific information to create comprehensive control mechanisms in the place of the wide control measures set out in the waste legislation.

There are also some benefits in relation to recovery of waste and hazardous waste status. The specific legislation applied to hazardous wastes creates additional (compared to non-hazardous waste) obligations to its holder and the operator trying to recover it.521 Article 18 of the WFD lays down an absolute ban on mixing hazardous wastes either with other categories of hazardous waste or with other waste, substances or materials. In practice, this means that hazardous wastes should be rather homogenic. Many waste streams, such as municipal mixed waste streams, are very problematic to recover due to their heterogeneity: such waste streams cannot be used in material recovery operations in a profitable way and, due to this, are often used in energy recovery. This problem should not exist in the same extend in relation to hazardous waste.522 Hazardous waste requires more legal and technological innovations in its treatment and use than in its collection mechanisms. This certainly is not the case for all waste material.

Hazardous waste treatment and recovery is often more complicated than the treatment and recovery of non-hazardous waste due to the environmental and human health risks that are the key feature of hazardous waste streams. Controlling

516 C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142.
517 This conclusion should also fully apply to by-product status in relation to hazardous waste, the difference being that if a material is considered a by-product it is at no point considered a waste.
518 C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142.
519 REACH can be a useful tool in relation to by-product status.
520 As it is not explicitly forbidden for hazardous wastes to cease to be waste, according to textual approach, hazardous waste may cease to be waste when they fulfill the EoW criteria. Also see Van Calster 2015a, p. 89.
521 However, a stricter legislative framework on hazardous waste material also means that waste management operators are better informed about the features and impacts of the waste material. This may have a positive effect on the impacts of waste management operations.
522 COM (2015) 614 final, p. 9. Improvements in waste collection and sorting are needed to raise the levels of recovery operations that retain the value of the waste materials. Many mixed waste streams can be recovered but in order to retain their value, better alternatives should be strived for than e.g. recovery as energy.
the hazardous features of waste material and the risks they pose to the environment
and to human health is an important aspect of hazardous waste treatment, following
which the waste material can be used better. The treatment of hazardous waste
streams can require different kinds of physical and chemical treatment mechanism. Hazardous wastes can be managed by means of stabilisation and storage or, in some
cases, incineration. The option of reclaiming and regenerating chemical substances
from hazardous wastes is also available.

Hazardous waste and its management can create problems in the circular economy.
In order to create a functioning circular economy for hazardous waste streams, record-
keeping and traceability should be ensured through registries and through identifying
capacities and bottlenecks. At the same time it must be ensured that waste materials
in circulation do not possess properties that pose dangers to the environment or to
human health such that these materials should be removed from circulation. In Lapin
luonnonsuojelupiiri the CJEU’s judgment identified a bottleneck for hazardous waste
management: the EoW criteria can be applied to hazardous wastes. The main difference
between non-hazardous and hazardous waste are the risks on the environment and on
human health, which can often be controlled through other legislative frameworks.
Even though deconstruction of the bottlenecks for recovery of hazardous waste
streams is a possibility, the more sustainable option would be to minimise the use of
hazardous substances in goods and in this way minimise the generation of hazardous
wastes. This could be achieved by updating the regulatory framework on waste
management, product regulation and BAT (best available technology) requirements.

3.8 FOLLOWING EXCLUSION FROM THE CONCEPT OF
WASTE

3.8.1 No longer waste

According to de Sadeleer, the benefits of the declassification of waste are ‘undeniable’. A substance or object ceasing to be waste or being classified as a by-product from
the outset offers the same kind of advantages. Articles 1 and 2 of the WFD restrict
the scope of application of the WFD to operations concerning the generation and
management of waste. Therefore, if a material is not considered waste the WFD does
not apply. As the waste legislation no longer applies to by-products or EoW products,
its provisions on environmental and human health protection no longer apply. While

523 This over-simplified nature of this view results from inability to discuss the technical nature of the
hazardous waste management option due to lack of knowledge on this topic.

524 The incineration of hazardous wastes is also regulated under chapter IV of the IED as is incineration of
non-hazardous wastes.


526 See COM (2015) 614 final, p. 12. The Commission states that the unnecessary burden on recyclers should
be reduced and that traceability and risk management of chemicals should be facilitated in the recycling
processes.


528 See de Sadeleer 2012, p. 152.
the waste status puts the substance or object within the scope of application of the WFD, it restricts the application of overlapping product legislation and standards: when something is not considered waste, all the legislation applicable to similar non-waste product starts to apply. Not applying the provisions of the WFD does not mean that the waste-based product falls outside the ambit of the quality and emission control schemes, as they are merely executed in accordance with other legislative frameworks.529

Exclusion from the scope of application of the WFD and other provisions of waste law is often said to lighten the regulatory burdens involved in using waste in recovery operations. In many cases this is true since the utilisation of the waste-based materials would no longer require a permit for waste management. However, in many other cases the substances or objects are returned to manufacturing processes that are likely to be covered by other EU legislation such as the IED. Industrial processes are rarely completely outside the permitting schemes but not having to deal with the additional control and monitoring involved in using waste in production processes should lighten the regulatory burden, at least to some extent. The new legislative framework often contains less control and monitoring, which, due to the potential for environmental risks in the context of waste management, are typical characteristics of waste regulation.

The rationale behind EoW and by-product status is similar even though the criteria apply to different kinds of materials. By-products are often used in the production process in which they were generated, but EoW products are often sold to other operators. In relation to EoW, the criteria seems to function as an instrument by which to improve the functioning of the internal market and resource efficiency, through harmonisation of the rules on whether materials are waste or not. Both criteria are ways to improve the efficient recovery of materials.530 The criteria and the quality standards for by-products or EoW products also improve the quality of waste-based secondary materials. Furthermore, removing the stigma of the waste status may have significant benefits in terms of improving user perception in relation to waste-based materials and products.531

The declassification of substances or objects as waste should contribute to the promotion of resource efficiency and the objective of finding the best available way to prolong its life-cycle or benefiting from the waste stream in another way. As emphasised above in respect of both sets of criteria, the declassification of substances or objects as waste should not cause adverse environmental or human health impacts. This is explicitly taken into account in both sets of criteria. Lightening the regulatory burden and reducing the costs of using these materials is a way of promoting resource-efficient choices in industrial practices. The circular economy package also strives to achieve economic development in a sustainable manner.

529 REACH plays an important role in the exclusion of materials from the concept of waste and offers quality control and protection of the environment and of human health. Drawing a line between the WFD and REACH is discussed further in the next chapter.

530 Although, in legal terms, by-products represent waste prevention as they are never considered waste.

Providing a system where the two different interests complement each other is one of the main objectives of the circular economy package.\textsuperscript{532} Easier access to high quality waste-based raw materials should provide multiple benefits in relation to waste management and industrial production. The increased substitution of virgin materials with waste-based materials usually results in environmental benefits at both ends of a product’s life-cycle.

More precise regulation means that more effective environmental protection measures containing less restrictive control and monitoring mechanisms can be enacted. Detailed regulation based on scientific information on departing from the general concept of waste provides environmentally acceptable and safe control mechanisms for waste. The environmental acceptability of the declassification requires that the use of materials does not cause negative impacts on the environment or on human. Clarifying these impacts also removes the need for additional precautionary provisions of the waste legislation as the negative impacts can be controlled and monitored through more specific provisions of product legislation.\textsuperscript{533}

The EoW legislation can provide a new quality control scheme to ensure that the high level of protection that is necessary when a material ceases to be waste is achieved. No exact quality standards have been set out in the WFD regarding control of the quality of waste streams but it does contain provisions concerning adequate ways of managing that waste regardless of its quality. Whether the WFD ceasing to apply factually reduces the bottlenecks involved in closing the loop is entirely down to the legislative framework that contains the provisions laying down the non-waste status, the waste stream itself and the existing regulatory framework on similar non-waste products.

Industrial processes rarely fall completely outside the scope of permitting schemes but not having to deal with the additional control measures deriving from the waste status should remove some of the bottlenecks associated with waste status. The precautionary mechanisms contained in the provisions on waste recovery aim to ensure a high level of protection of the environment and of human health when the properties of the waste material are unknown. Due to this lack of knowledge, their use cannot be regulated through specific provisions but must be governed through vague overarching additional control measures.\textsuperscript{534} Nonetheless, there is the theoretical possibility that, due to the dangerous features or risks that the non-waste product possesses the legislative framework post-waste could be stricter than the control schemes laid down in the waste legislation.

The applicable legislation post-waste can also create restrictions and barriers for the circulation of the material. Nevertheless, even when exclusion from waste status fails to address the problems directly related to the regulatory burden affecting the

\textsuperscript{532} COM (2014) 398 final, pp. 2–3.

\textsuperscript{533} See e.g. de Sadeleer 2002, p. 91, for the view that different kinds of precautions and the precautionary principle of environmental law are often based on the unknown or unexpected impacts of operations. Access to an adequate level of information on the operation and its impacts and risks can show either that precautions are unnecessary or that they, in fact, are in place to factually protect the environment or human health. See also Sunstein, Cass R., \textit{Law of Fear: Beyond the Precautionary Principle}, Cambridge University Press 2005, p. 59.

\textsuperscript{534} Cheyne 2007, p. 475. Cheyne argues that general and pervasive provisions governing waste, such as these, are liable to hinder the clarity and precision of the legislation as well as create inappropriate regulatory burdens for the use of waste materials.
substance or object, it creates a distinction between the better and worse quality waste-based substances. In this way, it creates a control mechanism to separate safe materials from materials that still need overarching precautionary provisions to be laid down in waste legislation in order for safe utilisation to take place.

3.8.2 Applying REACH to EoW and by-products

The legal framework regulating a substance or object post-waste also covers similar virgin materials and products. The interface between the EU’s waste and chemicals legislation has some problematic aspects. This is partly due to the sheer level of complexity of the legislation involved, and partly to the fact that they have very different fundamental elements and aim to solve different problems. The reason for such contradictions within ‘neighbouring’ regulatory frameworks is that a proportion of the relevant legislation strictly aims to remove the bottlenecks involved in using waste materials in industrial processes. On the other hand, the legislation aims to ensure a high level of protection of the environment and of human health.

REACH aims to improve the protection of the environment and of human health from the risks posed by chemicals while enhancing the competitiveness of the EU’s chemical industry and internal market. It contains numerous different controlling mechanisms. First, as a general rule, all chemical substances manufactured within or imported into the EU in quantities above an annual volume of one tonne have to be registered. The main objective of this registration, which has been referred to as the cornerstone of the REACH regime, is to produce data on the hazards and guidance for the safe use of chemical substances. Manufacturers and importers are responsible for producing the necessary chemical safety data for the registration dossiers. REACH also requires the authorisation of substances of very high concern (SVHC). The authorisation pursues the objective of replacing these substances with less dangerous substances or technologies where technically and economically feasible alternatives are available. It also lays down restrictions to protect human health and the environment from unacceptable risks posed by chemicals by limiting or banning the manufacture, placing on the market or use of certain substances.

The REACH definition of a chemical substance is extensive and also covers residual materials: a substance means a chemical element and its compounds in the natural state or obtained by any manufacturing process. However, several materials are excluded from the scope of the regulation or exempted from the application of certain provisions of it. Article 2(2) of REACH states that REACH does not apply to waste

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535 This chapter is largely based on Alaranta & Turunen 2017, pp. 163–173.
536 While legislation covering both chemicals and waste has traditionally focused purely on the protection of human health and the environment, promoting material efficiency and material flow have been introduced in modern waste legislation as important additional objectives.
539 Article 3(1) of REACH. Definitions like ‘substances’ and ‘objects’ widely used in the waste legislation refer to different thing in the systematics of chemicals regulation.
as defined in the WFD. However after the WFD ceases to apply, all EU legislation relating to chemicals starts to apply where this is necessary. The provisions of REACH have some special features when they are applied to waste-based materials such as by-products and subjects of EoW.

According to REACH, many residual materials are considered ‘articles’ and the registration requirement applies only if the article contains substance(s) intended to be released during the use of the article. REACH defines an article as an object which during production is given a special shape, surface or design which determines its function to a greater degree than does its chemical composition.

The REACH requirements in respect of recovered residual materials are based on the waste status of the materials under the WFD since wastes are entirely excluded from the ambit of REACH. If a waste-based material does not cease to be waste when recovered, it will remain outside the scope of application of REACH. Nevertheless, if a waste material does in fact attain EoW status REACH will apply. However, pursuant to a specific exemption, known as a recovery exemption, laid down in Article 2(7)(d), such EoW materials are not subject to the registration obligation. The same exemption provides that a substance recovered from waste is excluded from registration if someone else has already registered the same substance and the recovery operator has access to the chemical safety data of the registration. In other words, the recovery operator will have to complete a REACH registration if he or she does not have to obtain access to the registration data of the chemicals.

In the context of the recovery exemption, there are two alternative situations. First, the original substance can ‘merely’ be recovered through different kinds of regeneration activities. The regeneration of waste oils as defined in Article 3(18) of the WFD is an example of this kind of recovery. Second, the recovery process can be a manufacturing process related to a totally new substance or substances. This is, for instance, the case when biofuels are refined from waste-based raw materials. The distinction is rather similar to the distinction between preparing for re-use and recycling. The recovery exemption under REACH can also be applied to both the situations where the materials are subject to the registration requirement if the conditions of the exemption are not fulfilled.

Due to the substance identification policy laid down in REACH, in practice the application is limited. In the REACH system, substance identification means the process in which registrants of a similar substance agree on the conditions on which to determine the sameness between the substances for purposes of REACH registration. In essence, substance identification is a matter of agreement between the registrants, but the European Chemical Agency (ECHA) can intervene in the context of the registration dossier evaluation process. The challenge is that the recovered

\footnote{For more information on the exclusions from the scope of the application of REACH, see Vaughan, Steven, EU Chemicals Regulation: New Governance, Hybridity and REACH, Edward Elgar 2015, pp. 43–48.}

\footnote{Including the safety data sheet required in Article 31 REACH where applicable and the duty to communicate information down the supply chain of Article 32 REACH where the safety data sheet is not required.}

\footnote{Registrants of the same substance form a so-called Substance Information Exchange Forum (SIEF), which is an important mechanism by which to give effect to the ‘one substance, one registration’ (OSOR) principle contained in the regulation, which aims e.g. at avoiding unnecessary animal testing. See Hansen & Blainey 2008, pp. 117–118.}

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materials often contain impurities or are so-called UVCB substances. This means that they do not reach the sufficient level of sameness and therefore do not fit the substance identification of existing registrations and cannot take advantage of the recovery exemption. Even if the recovery exemption can be applied, its practical effect as a resource efficiency incentive is minor. The recovery operator must obtain access to the main part of the registration dossier data and the cost savings compared to registration may be reduced significantly.

If the recovery exemption does not apply for the reasons mentioned above, the recovery process is regarded as manufacturing of chemical substances and full REACH registration is required. On the one hand, this is logical: from the chemical safety objectives point of view it would not be justifiable to exempt certain materials from the scope of the regulation just because they are waste-based. Waste-based materials can also pose chemical risks to human health and the environment in the same way as any other virgin chemical substances. The total exemption of by-products and EoW products would leave potentially dangerous materials unregulated and cause unforeseen health and environmental impacts. On the other hand, however, the full registration requirement for recovered materials can be criticised for not promoting the objectives of the circular economy. The regulatory burden of the registration process can hinder the recovery of residual materials.

Registration exemption for by-products is different. It only can be granted in two situations: (1) when the operator further processes a by-product of its own production facility and this processing leads to the formation of a new substance or substances, in which case the original by-product is exempted but the end-product is subjected to the registration process; and (2) when the industry operator combusts a by-product in its own power station. If neither of these exemptions apply, by-products are subject to the registration requirement as are non-waste products. Providing a by-product to another operator, against payment or for free, must be considered as placing it on the market and therefore the producer is subject to a registration obligation. Residual materials may also be or become subject to the authorisation and restriction provisions of REACH if they contain substances of very high concern or cause unacceptable risk to human health or the environment, as is true of any other substance or mixture. The exemptions from the registration obligations shall be interpreted narrowly along the lines of the wording of the provisions. This kind of strict textual interpretation increases the legal certainty created by the provisions complements the functioning of the internal market for chemicals.

REACH registration and the substance identification schemes require that the necessary information concerning the waste-material’s environmental acceptability is examined. Therefore, as was done in Lapin luonnonsuojelupiiri, it is well established that after the data has been provided there should be no reason to apply the precautionary principle, which, in waste legislation, relates to the unknown elements of waste materials. Therefore, to the extent that the identified chemical properties can

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543 Substances of unknown or variable composition, complex reaction products or biological material.
544 For example, a by-product was marketed to another user in C-113/12 Brady, ECLI:EU:C:2013:627. However, Brady did not concern the application of REACH.
545 It also emphasises the environmental protection objectives of the regulation by providing clearer uniform rules for supervision of chemical products and extends the scope of application of the provisions of REACH.
546 See C-358/11 Lapin luonnonsuojelupiiri, ECLI:EU:C:2013:142.
be controlled outside the legislative framework on waste, there should be no doubt that the additional control measures in waste legislation are unwarranted and the waste should cease to be waste whereas the three first criteria are also fulfilled.

3.8.3 The interface between waste and chemicals regulation

The coordination of the interface between waste and chemicals legislation involves weighing the arguments of environmental acceptability against those of economics in order to evaluate not only the sustainability per se but also the scale and perspective of environmental sustainability as a whole. The Commission’s 2015 Communication on this topic strongly highlights the significance of the environmental benefits of the circular economy. ‘Taking into account the legislation on both wastes and chemicals is challenging but necessary in order to adequately control chemicals while promoting resource-efficient use of waste-based materials. There remains some degree of obscurity on the interface between waste and chemicals regulation but the Commission has sought to address these issues in its 2018 communication.

In the January of 2018 Commission published the communication on options to address the interface between chemicals, products and waste legislation alongside a Commission staff working document. The Commission recognised four main problems on the interface that hindering the transition from waste to product. First of the identified issues was that the information on the presence of substances of concern is not readily available to those who handle waste and prepare it for recovery. Usually all the operators in the life-cycle of a product have access to the information on their presence (according to REACH and CLP regulation) but once a product is classified as waste the information is no longer carried forward forward

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548 COM (2015) 614 final, p. 2: the Commission states that the circular economy ‘will save energy and help avoid the irreversible damages caused by using up resources at a rate that exceeds the Earth’s capacity to renew them in terms of climate and biodiversity, air, soil and water pollution’. On the other hand, the circular economy initiative has strong ties with economic development.

549 See Alaranta 2018.

550 European Commission: Roadmap to ‘Analysis of the interface between chemicals, products and waste legislation and identification of policy options’. European Commission 2017, pp. 1–2. There are question marks as to what amounts to sufficient information about substances, the presence of substances of concern in recycled materials, how the materials can cease to be waste, and the difficulties of applying the EU concept of waste. This dissertation partly answers the two last questions but the issue of creating legal certainty through the concept of waste and its exclusions is mostly up to the regulatory authorities and case-by-case decision-making on by-products and EoW in Member States.

551 SWD (2018) 20 final. Commission Staff Working Document Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the implementation of the circular economy package: options to address the interface between chemical, product and waste legislation.

as the waste management is not a part of the supply chain of the REACH regulation. Therefore better access to the information would require significant amendments to the regulatory status quo.\textsuperscript{554}

Second issue was that the waste may contain substances that are no longer allowed in new products (so called \textit{legacy substances}). As EoW products are generally under the same legislative framework as new products,\textsuperscript{555} the initial view should be that these materials could not be recovered in new products due to the prohibition. The Commission suggested a possibility of a compensation system with trade-offs between the risks caused by legacy substances and the benefits gained from more efficient waste recovery. Nevertheless, the trade-off system would require significant legal amendments and their application in case-by-case evaluation would most likely prove to be very complicated.\textsuperscript{556}

The third identified issue was that the EU’s rules on EoW are not fully harmonised and it makes it uncertain how waste ceases to be waste. The Commissions calls for action in developing the case-by-case decision-making systems as well as drafting new EU wide legislation on EoW. It would seem like the Commission was back on track after losing its appetite after failing to regulate on EoW paper. However, no targets waste streams for EU wide EoW are mentioned. Therefore, it is very likely that it will take a while before new EU wide EoW regulations are enacted. The Commission also suggests creating a more level playing field between waste and products by removing the possibility for recovery exemptions of REACH Regulation.\textsuperscript{557}

The fourthly the rules to decide which wastes and chemicals are hazardous are not well aligned affecting the uptake of secondary raw materials. While transitioning from the regulatory framework of waste to the regulatory framework of products and vice versa, hazardous wastes are not necessarily hazardous chemicals and discarded hazardous chemicals are not always classified as hazardous wastes. The supply chain of the chemicals regulation keeps the classification of chemicals well in line during the life-cycle of the product but after the product becomes waste the information is usually lost. Commission calls for a more harmonised classification system between the different frameworks. However it acknowledges that creating a harmonised system between waste (WFD) and chemicals (CLP) regulation would be highly complicated.\textsuperscript{558}

The Commission proclaimed that it will start multiple research projects and aims to work with relevant stakeholders and ECHA in order to solve the above-mentioned problems. The development should be well under way at the end of the current Commissions term in the end of 2019.


\textsuperscript{555}Guidance on waste and recovered substances. European Chemicals Agency 2010, p. 5: In addition, operation recovering waste is considered as a manufacturing process according to REACH.


3.8.4 Recycling targets and end-of-waste

3.8.4.1 End-of-waste products

It would leave a huge gap in the logic of waste management if waste-based non-waste product and their utilisation were to be left out of the recycling and recovery target schemes. Original version of the WFD included Article 6(3) of the WFD that provided that waste which ceases to be waste in accordance with paragraphs 1 and 2 shall also cease to be waste for the purpose of the recovery and recycling targets set out in Directives 94/62/EC,559 2000/53/EC,560 2002/96/EC,561 and 2006/66/EC562 and other relevant EU legislation when the recycling or recovery requirements laid down in that legislation are satisfied. In the 2018 amendment the provision has been removed. However this should not be understood as a statement that EoW materials would not be counted into the recycling targets. It is clear that end-of-waste products are included in the recovery targets since non-waste status only starts to apply after recovery. The guidance document for the interpretation of the WFD explains that this means that EoW materials are included in the calculations concerning recovery (including recycling) targets if no specific requirements are laid down in the directives related to the waste stream that would require further monitoring. For example, steel scrap from end-of-life vehicles that meet the EoW criteria for steel scrap is no longer considered but it is calculated towards the recycling target set for end-of-life vehicles in the Directive 2000/53/EC even before it has actually been reprocessed in a smelter.563

Article 11 of the WFD lays down the re-use and recycling targets for 2020. Member States are to take the necessary measures designed to achieve the targets. First, ‘by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight’. Second, ‘by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of wastes shall be increased to a minimum of 70 % by weight’. The targets were expanded in the 2018 amendment to the directive and the current Article 11(2) also states that In order to comply with the objectives of this Directive, and move to a European circular economy with a high level of resource efficiency, Member States shall take the necessary measures designed to achieve the following targets: by 2025, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 55 % by weight, by 2030, the preparing for re-use and the recycling of municipal waste shall

be increased to a minimum of 60% by weight and by 2035, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 65% by weight.

The new paragraphs 3 and 4 provide a possibility for postponing the deadlines for attaining the targets for countries that not performed well in the recovery of waste. Member States should consider the recycling targets while assessing departures from the waste hierarchy since the targets are binding and the hierarchy itself only seems to be an obligation of best effort. Neither of the waste streams mentioned in Article 11 of the WFD involve EU-wide EoW criteria but the possibility of setting such criteria at national level still remains.

The targets set out in Article 11 of the WFD are deeply rooted in the concepts of preparing for re-use, recycling and other material recovery. Since other material recovery does not cover energy recovery and reprocessing into materials which are to be used as fuel, waste-to-energy operations cannot be utilised even in the targets. The recovery targets basically only take preparing for re-use and recycling operations into account in the quotas. Backfilling operations can also be taken into account in the targets for construction and demolition (C&D) waste. Nevertheless, waste prevention cannot be included in the quotas. Considering the objectives of the waste legislation, this seems contradictory to the main objective of the hierarchy, which is to prevent the production of waste. Calculating waste prevention is considered highly complicated, particularly in the absence of clear standards on how to do it.

All current EU-wide EoW criteria are designed to bring about material recovery but there is no barrier to legislation on ceasing to be waste in relation to materials destined for energy recovery. According to Article 11 of the WFD these cannot be included in the recycling targets. However, this is not always so: Directive 94/62/EC sets recycling targets in respect of which the recovery measures are not limited to material recovery operations. Similar recycling targets are set out in the Waste Strategy of England. Considering the objectives of the EU’s waste policy it makes a lot of sense to seek to achieve as much material recovery as possible, but it also makes sense to prioritise the recovery of energy from waste over disposal operations. The possibility of counting the recovery of energy from waste in respect of the targets should not be used as a loophole but as an incentive promoting energy recovery instead of disposal for materials inadmissible for material recovery.

Directive 2000/53/EC, which concerns end-of-life vehicles, does not explicitly forbid counting energy recovery towards its recovery targets. However, a big part of end-of-life vehicle waste streams is unsuitable for energy recovery, or at least a more suitable material recovery measure can often be found. The parts that can be used in energy recovery shall be calculated towards the recovery targets in question when used in energy recovery. Directive 2002/96/EC (no longer in force), which concerned waste electrical and electronic equipment, also set its own recycling targets. This directive has been replaced by Directive 2012/19/EU (hereinafter the ‘WEEE Directive’) Article 7 of


565 Van Calster 2015a, p. 50. For more on the problems of C&D waste and recycling targets, see Turunen & Van Calster 2016, pp. 1–9.


which provides that Member State shall ensure the implementation of the ‘producer responsibility’ principle and that a minimum collection rate is to be achieved annually. Member States shall give priority to the re-use of whole appliances.

Directive 2006/66/EC sets recovery and recycling targets in relation to batteries and accumulators, with its Article 10 containing binding collection targets for these items. In relation to further processing and recovery of the batteries and accumulators, the term ‘recycling’ is used in a similar sense to the WFD. Thus, energy recovery – as understood in accordance with Annex II to the WFD – is not a legally acceptable treatment option for batteries or accumulators nor is it calculated as part of the collection and recycling targets set out in the Directive.

The current amended regulatory framework sets targets for 2020, 2025, 2030 as well as 2035. In addition, new Articles 11a and 11b are proposed and lay down uniform rules for calculating the achievement of the targets and an early-warning mechanism. The latter refers to a process where the Commission shall, in cooperation with the European Environment Agency, draw up reports on the progress made towards the achievement of the recovery targets three years before each deadline laid down in those provisions at the latest. The reports shall include the following: (1) an assessment of the achievement of the targets by each Member State; and (2) a list of Member States at risk of not achieving the targets within the respective time limits accompanied by appropriate recommendations for the Member States concerned. Some Member States have applied for the early warning trial run due to their not being likely to achieve the targets laid down in Article 11 of the WFD.\(^\text{568}\)

### 3.8.4.2 By-products

The position of EoW status in respect of the recovery operation categories is clear and it is obvious that it can be included in the calculations in relation to the recovery and recycling targets because in this case the recovery and recycling operations will actually have been completed. However, there is no explicit ruling on wastes that have been given by-product status. The provision on by-products is formulated in a different manner from that on EoW status. In respect of EoW status the relevant provision states that ‘[c]ertain specified waste shall cease to be waste… when it has undergone a recovery, including recycling, operation’. However, in respect of by-product status, the relevant provision merely states that ‘[a] substance or object, resulting from a production process, the primary aim of which is not the production of that item, may be regarded as not being waste referred to in point (1) of Article 3 but as being a by-product only if the following conditions are met’. Although it does not make sense from a circular economy and EU waste policy perspective, the recycling and recovery targets appear to be tied to the strict textual formulation of terms such as recycling and recovery.

The main question about by-products in relation to the recycling targets seems to be that of whether using or manufacturing by-products is considered a recovery operation. By-products are non-waste to begin with and as such their utilisation is not considered to be a recovery operation. Unlike an EoW product, a by-product does not require a recovery operation to be completed, which might prove difficult in many instances.

\(^{568}\) Article 11b of the WFD regulates that the Commission shall, in cooperation with the European Environment Agency, draw up reports on the progress towards the attainment of the targets laid down in points (c), (d) and (e) of Article 11(2) and in Article 11(3) at the latest three years before each deadline laid down therein in so-called Early Warning procedure.
cases since if production residue is at no point considered waste it cannot be subject to a recovery operation. The granting of by-product status requires that all processing necessary for the further use of the material shall be considered as an integral part of the production process: hence, such processing is not considered recovery but a production process in respect of a product.

Producing by-products instead of waste would more fittingly be portrayed as a waste prevention operation. Considering the objectives of the waste legislation, it seems a bit contradictory to the main objective of the waste hierarchy laid down in Article 4 of the WFD, which is to prevent the production of waste. Calculating waste prevention is viewed as difficult or almost impossible without clear standards on how to do it. It would be rational if Member States could also benefit from waste prevention through the recycling targets. However, that would require the formulation of a method of calculation in relation to the actual prevention, as well as the monitoring of the effectiveness of the measures.

Zorpas and Lasaridi have defined some measures by which to calculate waste prevention that could be used in Member States in order to adhere to the main objective of the EU waste policy. One option is to estimate waste prevention by comparing the amount of waste produced at a point in the past with that produced now, or assessing the price advantage gained by the prevention. There is also a crucial difference between the kinds of indicators used to calculate waste prevention: these need to be in balance with economic, resource and waste policy objectives. One way to calculate waste prevention is to see how much raw material is needed to produce a new product. This measure of calculation directly emphasises the resource efficiency that has been set as one of the EU’s main environmental objectives. However, these calculation measures overlap and obviously cannot be used together. Using any of the measures would be problematic since none of them are legally binding and criteria for the calculation have not been set at EU level. However, until a measure for the calculation of waste prevention and prevention targets exists one should remain sceptical about waste prevention measures. Since there are no clear ways of measuring the prevention and setting targets for Member States, the waste prevention obligation is mostly rhetoric.

The problems with waste prevention in the recycling targets are prone to hinder the implementation of the waste hierarchy in other EU legislation. The proposal on reward of re-use in the recycling targets was published on 29 November 2016. It argues that re-use is an important part of waste prevention and waste prevention should be more than rhetoric. However, the second and third steps (preparing for re-use and recycling) are well represented in the recycling targets scheme. Choosing

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569 See COM (2007) 59 final, p. 4. Communication on by-product status does not deal with waste ceasing to be waste but the distinction between waste and non-waste in a production process. This underlines the point that a by-product is at no point considered a waste.

570 Van Calster 2015a, p. 50.

571 See Zorpas & Lasaridi 2013, pp. 1047–1048.

572 Zorpas & Lasaridi 2013, pp. 1048–1049.

573 See COM (2015) 595 final, p. 8, recital 10, for the point that uniform rules of measurements of waste prevention should be established in the EU’s legal framework.

574 Proposal on rewards of re-use in the recycling target by FIN, DK, EE, FR, IE, HR (29.11.2016). The text is based on compromise text from PRY 14152/16.
to exclude waste prevention from recovery targets seems a little arbitrary considering
the objectives of EU waste policy and the circular economy. By-product status is, after
all, perhaps one of the clearest indications that a product’s life-cycle is being prolonged
and that resource efficiency is being practised.

3.8.5 Shipment of waste and non-waste

3.8.5.1 Shipment of waste

The EU’s legislation on transboundary shipment of waste has tracked the development
of OECD regulatory trends for the most part, and also derives from Lomé575 and the
Basel Convention.576 Regulation (EC) No 1013/2006 is the EU’s regulation on waste
shipment (as amended by Regulation 660/2014577). The current legislation highlights
that the recovery of valuable raw materials from waste is crucial and that well-
established international and internal markets can promote that recovery. Both the
OECD and the EU base their waste shipment scheme on two lists of different kinds of
waste streams: amber list wastes and non-hazardous green-listed waste.578

The green list includes waste streams that are non-hazardous and are destined for
recovery. It is a combination of non-hazardous wastes listed in the Basel Convention’s
Annex and list of wastes not presenting any risks when destined for recovery within
the OECD area. The amber list includes the list of hazardous wastes set out in the
Basel Convention and the OECD list of wastes that are considered hazardous when
destined for recovery operations. This mixed character of the EU list, together with
the fact that the Basel and OECD lists are not entirely the same, presents difficulties
in terms of compliance since not all OECD members have ratified the provisions of
the Basel Convention.579

Green list waste may be freely circulated between Member States after notification
of the shipment is made. In addition to notification, the shipping documents shall be
kept with the shipments. However, the shipment of green list wastes does not require
a permit and consent from the waste shipment authority of the other state. Article 12(1)
of Regulation (EC) No 1013/2006 allows Member States to take the necessary measures
to promote their waste management plans in these waste shipments.580 Otherwise
green list wastes can basically be moved around on the basis of the same rules as
normal products between the Member States. The difference between moving green

575 An international agreement reached in 1975 by the European Economic Community granting associate
status to French overseas territories.

Disposal.


578 Originally there were three lists. The third list was called the red list and covered wastes that could only
be shipped after receipt of written authorisation by the authorities concerned. The new regulation on waste
shipment no longer includes the ‘red list’. The red list included waste streams that it was forbidden to ship
from one country to another due to their dangerous or unknown features. See Dieckmann, Martin, ‘The
Revised EC Regulation on Shipments of Waste: an Overview’, JEEPL 4 (1) 2007, pp. 41–46, for the point
that abolishing the red list aimed to simplify the classifications of waste.

579 Van Calster 2015a, p. 95.

580 See Krämer 2016, p. 383, for the point that this provision of law has not been used frequently.
list waste and other products is that, in respect of green list wastes, notification of its features and volume must be sent in advance.

The shipment of other (so called amber list) wastes is regulated under Article 4 of Regulation (EC) No 1013/2006, which provides that where the legal person executing the shipment intends to ship waste as referred to in Article 3(1)(a) or (b), he/she shall submit a prior written notification to and through the competent authority of dispatch and, if submitting a general notification, comply with Article 13. Article 4 governs the details of the content of the notification. The notification and consent procedure is lightened where several shipments have essentially similar characteristics, the waste is destined for the same purpose of use and the route of the shipment is the same.

In the notification and consent procedure any natural or legal person who intends to carry out a shipment of waste or intends to have a shipment of waste carried out on their behalf and to whom the duty to notify is assigned, submits prior written notification of the shipment. The competent authority of dispatch then answers with its consent, after which the movement of the waste can be completed. If consent is not given, the shipment cannot be executed. Failure to comply with these and other applicable rules on waste shipment means that the shipment will be illegal. Illegal shipment and transportation of waste within or outside the EU borders is a barrier to higher recovery rates and may cause leakage of valuable waste streams such as end-of-life vehicles.581

Quantities of waste have increased considerably. EU legislation and developing market forces are leading the way for waste recovery and, at the same time, waste shipments. In addition to the waste legislation, which is mostly environmentally driven, a considerable proportion of waste recovery is promoted through market mechanisms. However, this legislative framework has resulted in a situation where increasing amounts of recyclable waste materials are put on the market in order, for example, to reach specific recycling rates for a certain waste stream. In addition, the need for secondary materials has been emphasised due to increasing prices of virgin raw materials. On the one hand, increasing shipments of waste could increase recovery rates for waste; but on the other hand the rules on shipment of waste aim to protect the environment in relation to shipments for disposal. Enabling market mechanisms should only be in operation in relation to waste streams that can better be recovered in another location.582

The Regulation on shipments is based on environmental protection and has always functioned with a certain set of guiding rules: the principles of self-sufficiency and proximity; different procedures that apply to different wastes and different purposes of use; Member States’ ability to object, on an environmental protection basis, to shipments of waste destined for disposal; and the prohibition of exports to third countries for disposal.583 Exports of hazardous waste for recovery from a Member States to non-OECD countries are also banned.584 Shipments destined for disposal are

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583 Van Calster 2015a, pp. 95–96.

584 See EEA Reports No 1/2009: Waste without borders in the EU? Transboundary shipments of waste, p. 6. This is due to the assumption that non-OECD countries usually do not have proper and sufficient treatment capacity.
subject to stricter regulation than those destined for recovery. Article 16 of the WFD provides that Member States shall take appropriate measures, in cooperation with other Member States where this is necessary or advisable, to establish an integrated and adequate network of waste disposal installations and of installations for the recovery of mixed municipal waste collected from private households, including where such collection also covers waste from other producers, taking into account best available techniques.

This does not mean that every Member State should have all possible waste treatment option available. Article 16(2) to (4) covers the following issues. The network shall be designed to enable the [EU] as a whole to become self-sufficient in waste disposal as well as in the recovery of waste referred to in paragraph 1, and to enable Member States to move towards that aim individually, taking into account geographical circumstances or the need for specialised installations for certain types of waste. The network shall enable waste to be disposed of or waste referred to in paragraph 1 to be recovered in one of the nearest appropriate installations, by means of the most appropriate methods and technologies, in order to ensure a high level of protection of the environment and of public health.

The principles of proximity and self-sufficiency do not mean that each Member State has to possess the full range of final recovery facilities within that Member State. Otherwise, situations where the nearest adequate waste treatment option is in another Member State might cause a clash of the two principles. Nonetheless, the self-sufficiency of waste management should be evaluated at EU level instead of at national level. Each Member State should, in any case, have the necessary infrastructure to fulfil its own waste management obligations. The evaluation of an adequate level of self-sufficiency in relation to waste management capacity can be made at EU, national or regional level. The rationale behind the proximity principle is to ensure that the waste subjected to the self-sufficiency principle is supplied to one of the closest possible waste treatment installations.

Both the applicable legislation and the CJEU’s case-law indicate that the principles of proximity and self-sufficiency do not apply to waste streams destined for recovery (excluding municipal wastes). The application of these principles is limited to waste materials destined for disposal and to all municipal wastes. This restriction enables the possibility of a wider range of waste treatment options and can at best promote more efficient waste recovery operations. The principles emphasise the Member State’s ability to control its own waste treatment operations and economic and environmental interests.

Shipments destined for disposal are subject to the principles of proximity and self-sufficiency. This could in theory result in systematic objections against all

585 See e.g. EEA Reports No 1/2009: Waste without borders in the EU? Transboundary shipments of waste, p. 6.
586 See Jans & Vedder 2012, p. 482.
587 See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 289, for the point that economic factors also play a big part in this evaluation. For example, the distance over which aggregates are shipped for a recovery operation cannot be more than 50 kilometres from the generation site in order for the recovery operation to remain profitable.
589 See Van Calster 2015a, p. 4.
shipments of waste destined for disposal. In addition to that, the WFD provides that these principles should also apply to the recovery of municipal waste. In practice this means that municipalities can prohibit the shipment of their municipal waste and incinerate it themselves.\textsuperscript{590} The Member States may prohibit waste shipments for disposal on the basis of the principles of proximity and self-sufficiency if the same level of environmental protection cannot be ensured in the waste management process. The Commission has emphasised that the degree to which shipments are limited on the basis of the principles should be decreased in order to further the functioning of the internal market. The rationale behind this view is that as waste is considered a good pursuant to Article 34 TFEU the principles of proximity and self-sufficiency should not be applied strictly.\textsuperscript{591}

Van Calster argues that the linkage between the national waste management plan and the restrictions on shipment of waste is often exaggerated and that Member States tend to use waste management plans as open means of discrimination in the internal market. Restricting waste shipments on the basis of strict interpretations of the principles of proximity and self-sufficiency could be held to conflict with the provisions of the Treaty.\textsuperscript{592} Despite that, these principles give Member States the ability to control their municipal wastes and wastes destined for disposal. To play it safe, even when such restrictions of shipments are imposed, this should be done in an even-handed manner and in the spirit of the principle of proportionality.\textsuperscript{593} Such restrictions have, for example, been justified on the basis of protection of health and life of humans.\textsuperscript{594} The national (or regional) measures relating to shipments of waste should be evaluated in accordance with Regulation (EC) No 1013/2006, which covers shipments of waste, but should also comply with the general rules and principles laid down in the Treaty, in particular the principle of free movement of goods.\textsuperscript{595}

Shipments within Member States can cause certain practical difficulties because Regulation (EC) No 1013/2006 does not fully apply to them.\textsuperscript{596} It is mandatory to carry shipment documentation with waste shipments but otherwise transportation within Member States remains relatively unregulated. Article 33 of Regulation (EC) No 1013/2006 provides that Member States shall establish an appropriate system for the supervision and control of shipments of waste exclusively within their jurisdiction. The system must be coherent with EU law.\textsuperscript{597} The principles of proximity and self-sufficiency may have a significant impact on the control of municipal waste management within Member States, since an operator producing energy from municipal waste would not have to compete for local MSW streams against other similar operators in

\textsuperscript{590} See Krämer 2016, p. 383, for the point that this provision has been applied frequently in Germany.


\textsuperscript{594} According to Article 36 TFEU. C-203/96 Dusseldorf (1998) ECR I-4075

\textsuperscript{595} C-324/99 DaimlerChrysler (2001) ECR I-4075, paras. 43–45.

\textsuperscript{596} See Amended Commission Proposal COM (1992) 121, OJ C115/4. The Council opted against including shipments inside Member States in the scope of application of the regulation.

\textsuperscript{597} See Van Calster 2015a, p. 100, for the point that this can be ensured by replicating the EU system in national law.
a different location. This could, in principle, be used as an instrument to evaluate the
efficiency and functionality of local waste-to-energy plants.

Regulation (EC) No 1013/2006 does not differentiate between different waste
recovery options and only differentiates treatment options as between recovery
and disposal. The mechanisms of the Regulation offer little incentive to provide the
best possible recovery options where more economically lucrative alternatives are
available.

3.8.5.2 Shipment of non-waste

Article 1 of Regulation (EC) No 1013/2006 states that the Regulation applies to
shipments of waste. Ergo, if a substance or object is not considered a waste but a by-
product or EoW product, the regulatory framework on shipment of waste does not
apply. The regulatory framework applicable to shipment of non-waste materials is
exactly the same as it would be for normal products within the EU. However, there
are some key differences in relation to differences between waste streams that are
not considered waste as between EU law and national law derived from EU legal
provisions on ceasing to be waste.

Article 28 of Regulation (EC) No 1013/2006 governs disagreements on the
classification of a substance or object in the following way: if the competent authorities of
dispatch and of destination cannot agree on the classification as regards the distinction
between waste and non-waste, the subject matter shall be treated as if it were waste.
This treatment shall be without prejudice to the right of the country of destination to
deal with the shipped material in accordance with its national legislation, following
arrival of the shipped material and where such legislation is in accordance with EU
or international law. Considering this, the national or case-by-case application of by-
product or EoW status does not make it possible for these materials to have access
to the internal market as products. The rationale behind legislation on this topic
at national level is to promote the use of nationally important waste streams and
ensure that this can still be done despite the rules on disagreements. With EU level
EoW criteria no such problem exists, since there should be no disagreement on the
interpretation of the EU-wide criteria.

EU level EoW criteria have a direct impact on the functioning of the internal market.
The lack of harmonisation often creates legal uncertainty in waste management
decisions and means that different actors may be dealing with the waste streams.
This kind of uncertainty is particularly problematic in relation to trade between
different Member States. There may be problems in relation to identifying waste
and the recovery operation status of a particular product. Article 28 indicates that
this would lead to a situation where the substance or object would be considered
waste destined for disposal if there was uncertainty as to classification between two
Member States. Following the application of EU-wide EoW criteria, the substance or
object is transported and used within the EU as a product without waste management
controls. In relation to national EoW regulation this only happens within the country

598 See Kalimo 2006, p. 638, for the point that the conundrum of whether a substance or object constitutes
as waste stands right at the crossroads of environmental protection and free trade.

599 It would seem that in addition to national or regional permit authorities also the national waste shipment
authorities can make case-by-case rulings on the waste status of the substance or object. The logic of Article
28 and the disagreements extends to disagreements as to whether the waste can shipped without the
notification and consent procedure.
in question, which is likely to restrict the use of the waste material to a national or regional market in order to avoid administrative and judicial costs or risks. This may prevent the materials reaching the location where they could in principle be used with highest benefits considering the environmental and health risks as well as economic aspects. Further development of the EU’s EoW criteria could contribute to the elimination of such trade barriers and the provision of environmental and economic benefits.\footnote{See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 21.}

Objections to shipments are founded on an environmental basis as stated earlier. The legislative framework appears to have been created to control the potentially harmful effects of waste shipments while at the same time directing the waste streams towards the most efficient waste management options. Both the by-product and the EoW criteria include the environmental acceptability of using the material as non-waste. EoW criteria are more likely to apply in situations where shipment of waste is relevant taking into account the limitations of the site at which the by-product is produced and processed. In unclear situations the materials are always considered waste.

Regulation (EC) No 1013/2006 does not offer the most direct indication of a move towards the circular economy. It ensures that waste is not sent for disposal where this would be done using inadequate processes and would result in lower environmental standards. In addition to the element of control it offers, the Regulation also enables a wider range of waste management options and opens possibilities for more efficient waste management in other Member States while retaining a high level of environmental protection. The Regulation promotes self-sufficiency in waste management on an EU-wide basis and liberates Member States from the obligation to have all the best waste management options available in their own territory. If nothing else, the Regulation serves the objectives of the circular economy by facilitating safe movements of waste materials and providing the most modern and efficient waste management options for all waste materials, at least for the period of transition to better waste management in all Member States.\footnote{COM (2014) 398 final, p. 10.}

\section*{3.9 WASTE ONCE AGAIN}

After a substance or object is classified as a by-product or ceases to be waste through the EoW the legal provisions on waste do not apply to it. It has to be taken into account that EoW and by-product statuses do not apply to substances and objects that are not destined for the specific purpose of use defined in the decisions declaring their non-waste status. This is because they do not fulfil the sets of criteria laid down in Articles 5 or 6 of the WFD. The same logic applies to the temporary storage of waste materials. Since potential EoW products are always destined for recovery operations, they can be temporarily stored for three years prior to being subjected to a recovery operation as wastes.\footnote{See De Römpf 2016, pp. 112, footnote 64, for the point that the three-year time frame is a general rule and this period can be extended in exceptional cases. However, no rules or guidance have been laid down for these exceptions.} Following the recovery operation they can be stored as products and the
limitations set out for temporary storage of wastes no longer apply. In this situation, the stored materials are automatically considered to be in a disposal operation and classified as waste.

However, it is possible that substances and objects that are used in a recovery operation or as by-products can be classified as waste even when they are used for their planned purpose of use. After a substance or object has been given non-waste status, in general the same legislative framework applies to it as to a virgin product. Therefore the same strict textual interpretation of the concept of waste is applied to by-products and EoW products.

As by-products and EoW materials are considered non-waste, their use as materials in the manufacture of products is not problematic in relation to the waste status of the end-product if no other waste materials are used in the manufacturing process. The product is exactly the same as any other product manufactured from virgin raw materials. It does not matter whether the EoW materials and by-products only form part of the product or the whole product is waste-based – the final product is subject to all the legislation applicable to similar virgin-based products. Therefore, when it is discarded, intended to be discarded or required to be discarded it shall be considered as waste as regulated under Article 3(1) of the WFD. After this, by-product status no longer applies because the material has already been classified as waste. However, EoW status is still available in respect of waste material that is classified as waste once again. In a sense, waste is at no point ‘final waste’ but can always cease to be waste through EoW status. However, due to the lack of a regulatory framework for landfill mining or of other means by which to return to use waste that has been disposed of, it is relatively complicated to recover waste streams that have been disposed of.

3.10 SUMMARY

A substance or object that would otherwise be classified as waste can be declassified as waste if it is classified as a by-product in accordance with the cumulative criteria laid down in Article 5 of the WFD. Materials that are already waste can cease to be waste if they fulfil the cumulative criteria laid down in Article 6 of the WFD. Operators can benefit substantially from not having their materials classified as waste. The application of by-product status is limited to production residues, which may or may not be waste. By-products are not considered to be waste at any point. They are tied to the production process and the primary product that is being produced in the process. The EoW criteria can in principle apply to all kinds of waste streams. EoW products are subject to a recovery operation while by-products are subject to a ‘normal’ production process. This creates certain unexpected impacts in relation to the recovery and recycling targets set out in the waste legislation.

Although the criteria for EoW and by-product status apply to different kinds of material streams, they seem to have two key elements in terms of fulfilling them. First, both sets of criteria seem to emphasise further factual use of the waste substance or object and attach importance to the principle that application of the criteria should not be used as a means of circumventing obligations laid down in the waste legislation. Second, in no circumstances can waste-based materials or production residues be

603 See Pike 2002, p. 207, for an early notion on moving in and out of the categorisation of waste.
excluded from the concept of waste if this would cause adverse environmental and human health impacts compared to the situation where the substance or object would be regarded as waste. Both sets of criteria are drafted for waste materials that have factual and environmentally acceptable capacity for further use. Furthermore, the use of the material as such should clearly be legal pursuant to the legislation on similar non-waste products.

After waste materials are declassified as waste the legislation on similar products applies to them instead of waste legislation. Often this means that the harmful impacts caused by using the substance or object will be governed by different kinds of product legislation instead of waste legislation. The material is classified as waste once again if it fulfils the definition of waste set out in Article 3(1) of the WFD, i.e. it is discarded or its holder intends or is required to discard it. Different kinds of product and production standards can also function as useful instruments for the determination of impacts on the environment and on human health caused by using waste-based product that is not considered waste and for ensuring that these are kept to an acceptable level.

The current regulatory framework on waste aims to promote the re-use and recovery of residual materials. The environmental and human health protection objectives of waste legislation together with the objectives of chemicals legislation can simultaneously regulate the risks posed by chemicals, for instance by means of discarding materials that include substances of concern. REACH lays down two different exemptions from the registration requirement in respect of waste-based material: one for by-products and one for recovered waste-based substances or objects such as EoW products. The similarity between the waste-based and virgin materials plays a central role in the recovery exemptions. Residual materials may also be or become subject to the authorisation and restriction provisions of REACH if they contain substances of very high concern or pose an unacceptable risk to human health or the environment, as is true of any other substance or mixture.\textsuperscript{604}

Regulation (EC) No 1013/2006 is more connected to the conceptual pairs of recovery and disposal operation and green and amber list waste than waste and non-waste. The main obligations set out in the Regulation derive from the distinction between these concepts. Non-waste materials are essentially treated like green list wastes. However, even shipments of green list wastes require the completion of a notification for the waste shipment that contains information about waste’s destination, features and further use. Amber list wastes have to go through a notification and consent process prior to their shipment. Without consent for the notification, shipments of amber list wastes cannot be executed lawfully.

Both Articles 5 and 6 of the WFD leave open the possibility of regulation at national level and in this way promote the more efficient use of nationally important waste streams. Although it might seem that there is a preference for EoW legislation to be drafted at EU level, it is clear that national EoW criteria are acquiring greater importance. After the failed attempt to lay down EU-wide EoW criteria for waste paper, it would seem that the Commission has not had the same appetite as before to produce new legislation on waste streams ceasing to be waste. Thus the importance of national regulation and case-by-case decision-making has increased in relation to

\textsuperscript{604} The role of REACH authorisation and restrictions cannot be discussed here in detail. For more information on those procedures, see Bergkamp, Lucas & Herbatschek, Nicolas, ‘Regulating Chemical Substances under REACH: The Choice between Authorization and Restriction and the Case of Dipolar Aprotic Solvents’, \textit{RECIEL} 23 (2) 2014, pp. 222–229.
using the concept of waste and its exclusions as instruments by which to achieve more efficient waste recovery and to further the circular economy.

Similar provisions exist for by-products, and Article 5(2) of the WFD enables the EU to lay down criteria for by-product status in greater detail. It is also possible to lay down such criteria at national level when no EU-wide criteria have been set for that specific waste stream. National legislation offers a means of overcoming the EU’s regulatory passivity and promoting the re-use and recovery of nationally important waste streams. The role of case-by-case decision-making has been emphasised in relation to by-product status since the non-waste status of by-products often has to be justified on the basis of relatively specific information on the production process.
4 MATERIAL RECOVERY: CASES INVOLVING COPPER SCRAP AND RARE EARTH ELEMENTS

4.1 INTRODUCTION

Although EoW legislation can apply to all wastes, its benefits and possibilities vary in relation to different kinds of waste streams. Recognising which waste streams are suitable for EoW regulation is important in terms of assuring the effectiveness and efficiency of the ensuing legislation. This chapter examines the potential presented by copper scrap and rare earth elements in the context of the circular economy. The waste stream analyses aim to provide concrete examples of the functioning of the circular economy through the existing concepts embodied in EU waste legislation. The chapter further analyses the possibilities that the existing concepts present in term of achieving the waste-related objectives of the circular economy: implementation of the waste hierarchy and creating a secondary material supply from waste-based materials. It discusses the way in which the concept of waste and its exclusions are constructed, and how they could be developed, to complement the objectives of the legislative framework. It also discusses the problematic aspects involved in the circulation of the material and the limits of regulation on ceasing to be waste.

The chapter examines the material recovery of copper and rare earths and how the concepts of waste legislation affect or could affect recovery operations in respect of copper scrap. The relevant information is framed in the context of achieving the objectives of the circular economy scheme by promoting efficient material recovery of recyclable metals. The objectives of the circular economy mainly refer to implementing the waste hierarchy laid down in Article 4 of the WFD and creating a secondary material supply out of recovered waste materials. Despite the obvious importance of copper as a raw material, it is not included in the list of critical raw materials at EU level as reliable and unhindered access to copper materials is currently available, whereas heavy and light rare earth elements are listed.605

First, regulatory and circular economy perspectives in respect of copper scrap are analysed. Copper scrap is a large waste stream that has been efficiently recovered for a long period of time. After that, the regulation and circular economy aspects of recovered rare earth elements are discussed. The rare earth element recovery scheme is still in baby shoes, with a worldwide recovery rate of less than 1 %.606 The existing infrastructure for recovering the waste streams is at a completely different stage of development, as a result of which it may be used to illustrate the possibilities and problems in relation to the use of the basic concepts of waste legislation as instruments by which to achieve the objectives of the circular economy.


606 See e.g. Recovery of Rare Earths from Electronic wastes: An opportunity for High-Tech SMEs. European Union 2014, p.7.
4.2 MATERIAL RECOVERY OF COPPER

4.2.1 Introduction

Recital 22 of the WFD states that the possible waste streams for which EU-wide EoW criteria should be developed include, among others, construction and demolition waste, some ashes and slags, *scrap metals*, aggregates, tyres, textiles, compost, waste paper and glass. To date the only EU-wide EoW legislation in existence covers four different scrap metals (iron, steel, aluminium and copper) and glass cullet. This indicates clear political pressure towards lightening the regulatory burden and removing the barriers and bottlenecks that hinder the use of secondary copper in copper production.

Copper scrap is a waste stream that has a high initial value. Prices of copper have always been high enough to indicate that copper and copper alloy scrap is valuable materials for which there is increasing demand. In theory pure copper is infinitely recoverable. This, of course, fails to take into account the difficulties involved in the collection and the separation of copper for products and alloys. The recovery of copper scrap has been so efficient that most of the copper materials ever mined are still in circulation. The market for copper and high-quality copper and copper alloy scrap has been well-established for a long time. In 2007, 8.2 million tonnes of recycled copper products were used globally (of which about 2.5 million tonnes were used in Europe). Copper scrap and other copper recyclables have been commonly used in copper production.

Like all other waste metals, copper scrap is important in terms of its value and recovery possibilities. Especially in relation to copper alloy scrap, the amount of copper in the alloys is an essential factor that affects the viability of its recovery. In respect of low-grade copper alloys that only contain small amounts of copper, the financial and practical viability of copper recovery is limited by the availability of economically beneficial recovery operations.

Copper and copper alloy scraps are most commonly used as secondary raw materials in copper production, substituting for virgin copper materials. In addition to the secondary material potential of recovering copper scrap, using waste-based copper as a raw material offer substantial environmental and economic advantages compared to using primary copper as a raw material considering the whole life-cycle of the production. Closing the loop by recovering waste-based copper materials is crucial for the copper industry and for downstream users of copper products. Furthermore, in view of increased competition for raw materials and the copper industry’s high dependency on raw materials, ensuring the future supply of copper raw materials through secondary supply is highly important.

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610 European copper institute – copper’s contribution to the EU’s Circular Economy. European Copper institute 2015.
Even though recovering waste streams like copper scrap is important for the goals of achieving the circular economy and closing the loop in production, it is clear that the circular economy cannot function purely on the basis of ‘cherry-picking’ the lucrative recovery operation and leaving waste streams that entail more complicated collection or separation and less economic potential untouched.\textsuperscript{611} However, examining a well-established and well-functioning recovery scheme such as copper and copper alloy scrap recovery shows the potential of the concepts embodied in the waste legislation to help achieve the objectives of the circular economy.

4.2.2 Recovery of copper scrap

4.2.2.1 Recovery routes
Copper and copper alloy scrap has a high value, is recoverable (even re-usable) without extensive preprocessing, and is therefore mostly subject to recovery operations instead of disposal operations. Copper and copper alloy scraps are mostly used in material recovery operations to substitute virgin copper materials in order to produce copper products. Here is a simplified version of the life-cycle of copper. First the copper material is extracted. Manual and mechanical methods can be used to sort, shred and magnetically separate the scrap. The extracted material can be virgin materials from mining or recovered materials from waste streams. The waste-based copper is also generated as a residue of producing copper products.\textsuperscript{612} After this, the copper material is used in producing semi-fabricated products. For waste-based copper or copper alloy scrap, this production process is considered to represent the point where they are recycled or re-used. By semi-fabricated products I refer to pipes and sheets made of copper that are then used in the production of more specific products such as cars, computers or houses.

The second option is pyrometallurgical pre-treatment, which includes sweating, burning insulation from copper wire and drying in rotary kilns to volatise oil and other organic compounds from the copper scrap. The third option is hydrometallurgical pre-treatment where low-quality residues containing copper are floated and leached to recover copper from slag. After the end-of-life of the products where the copper products were used, the copper products are taken back into waste treatment if possible. The scrap is returned to the production/recovery process to be used as a raw material for new semi-fabricated products and the life-cycle goes on and on. In this regard, it must be remembered that in theory copper is infinitely recoverable. The number of possible life-cycles is hugely dependent on the use of a functioning collection and separation scheme. However, copper collection and separation processes appear to function well.\textsuperscript{613} The best alternative to copper scrap recovery depends on the quality of the copper product and its purity. The lowest grade scrap is often smelted and

\textsuperscript{611} See Hagelüken, Christian et al., ‘The EU Circular Economy and Its Relevance to Metal Recycling’, Recycling 1/2016, pp. 242–253, p. 246. However, it is clear that since EoW regulation is based on the high quality and market potential of the waste product, cherry-picking is the right approach here.

\textsuperscript{612} These can be classified as the by-products of copper production if the criteria of Article 5 of the WFD are fulfilled.

\textsuperscript{613} Figure 1 http://copperalliance.eu/about-copper/recycling (last visited on 23 January 2017).
refined like concentrate, whereas high-grade coppers are often just smelted and not refined at all.\textsuperscript{614}

![Diagram](image)

**Figure 5. Recovery routes on copper scrap.\textsuperscript{615}**

Copper is used in the manufacture of cars, as well as in building and electronics. The problematic aspect of recovery routes for copper scrap is well illustrated in relation to buildings. A house, for instance, contains a huge amount of copper, but due to its long life-cycle, of potentially one hundred years or more, the waste-based copper is unavailable for recovery for that period. The same problem applies in respect of copper materials used in cars and other vehicles, but on a smaller scale since a vehicle’s life-cycle is shorter than that of a house and there is less copper in an end-of-life vehicle. Copper is also used in many products with shorter life-cycles, such as electronics. Nevertheless, regardless of the length of the life-cycle, all products containing copper should be subject to copper collection and recovery at the end-of-life stage. Long life-cycles can pose a problem where the supply of secondary raw materials is concerned, even though the main objective of the waste hierarchy and, in relation to waste, the main objective of the circular economy, is to prevent the generation of waste. Longer life-cycles are a crucial tool by which to achieve that aim.

**4.2.2.2 Copper scrap and waste hierarchy**

In terms of the waste hierarchy, most copper scrap is either a target for preparing for re-use or for recycling. Of the two, preparing for re-use is to be preferred according to the waste hierarchy set out in Article 4 of the WFD. Article 3(17) of the WFD defines recycling as any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations. The recovery operations referred to in Regulation (EU) No 715/2013 are recycling operations. However, copper wastes can also be a subject for preparing for re-use. Copper and copper alloy scrap refers to copper materials that have been shredded and


\textsuperscript{615} Simplified copy of the figure in http://copperalliance.eu/about-copper/recycling (last visited on 23 January 2017).
cannot be utilised as such. This scrap is molten and produced/recovered so that they constitute new raw materials. This process is considered to be a recycling operation.

Article 3(16) of the WFD defines preparing for re-use as checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing. Re-use refers to a purpose where products or components that are not waste are utilised in their original purpose of use. Waste-based copper product can also be a subject of preparing for re-use. Copper or copper alloy scrap, however, is a poor subject for preparing for re-use, which may only include light reprocessing such as cleaning and drying. Preparing for re-use functions well in relation to recovering whole components or parts of end-of-life products. This recovery option is available if complete and functional parts can be removed intact from products. This may well be possible for the above-mentioned semi-fabricated products such as copper sheets and copper pipes. In relation to these waste streams, the option of shredding them into copper scrap should be secondary to preparing for re-use if they can be directly returned to use as semi-fabricated products.

The application of a departure from the hierarchy does not alter the application of the hierarchy, as the recycling option usually involves a more intense reprocessing operation than preparing for re-use and the environmental effects caused by the preprocessing exceed those caused by simple and light reprocessing of preparation for re-use. Where possible, preventing waste generation completely is the best option and should be favoured over material recovery operations. This could, for example, include prolonging the life-cycle of the product. However, the EoW criteria can apply to waste that is already generated and has undergone recovery.

4.2.2.3 Copper scrap and recovery targets
No direct recovery target is laid down for end-of-life copper. However, recovery and recycling targets are set out for three waste streams that are important sources of secondary copper: waste electrical and electronic equipment (WEEE), end-of-life vehicles and C&D waste. The WEEE Directive and Directive 2000/53/EC (which concerns end-of-life vehicles) contain their own recycling targets. Buildings contain huge amounts of potential secondary copper raw materials. Article 11 of the WFD contains recovery targets for C&D waste.

Some 8.3 million tonnes of electronic waste were produced in 2005 and it is estimated that about 12 million tonnes will be generated in 2020. To address this problem the separate collection of WEEE was initiated at the end of 2006. The WEEE Directive obliges Member States to collect an average of 25 % of electrical waste in 2016 and 65 % in 2019. The recovery targets set out in the Directive get stricter over time. The recovery targets affect the producers of electronic products through the producer responsibility principle set out in the WEEE Directive and the RoHS Directive. Collected waste must be brought to authorised treatment facilities and its disposal is prohibited under Article 6 of the Directive.

Collected waste electronics must be treated, recycled or recovered in accordance with the best available techniques. The Directive lays down the recovery targets for waste and creates a financing mechanism for them that works in such a way that collection from private households is free of charge. It also creates a clearer distinction

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616 The recovery targets also differ between different product groups.
for the shipment of WEEE as products, as well as a recovery scheme, based on concepts such as recovery, preparation for re-use and recycling, for electronic waste. A certain percentage of all WEEE should be in these categories, as further specified in the WFD.

WEEE streams contain a variety of different materials like ferrous metals (48 % on average), non-ferrous metals (12 %), plastics (20 %), glass (5 %) and others. The average copper content of WEEE was estimated to be 7 % by weight. With that kind of copper saturation, WEEE streams can work as functioning copper ‘urban mines’ and the relatively high copper content also makes recovering it rather beneficial from the perspective of recovery targets for WEEE. Recovery targets for WEEE can, in addition to constituting strong economic incentives, work as incentives for better copper and copper alloy scrap waste management.

Directive 2000/53/EC governs end-of-life vehicles. Article 5(4) of the Directive requires Member States to establish take-back schemes for end-of-life vehicles under which the last user has to have the right to give the car back free of costs. The Directive also aims to reduce the presence of heavy metal in cars. Furthermore, it sets out basic rules on adequate waste treatment, including the obligation to separate certain parts of the car in treatment operations and to treat them differently. The regulatory framework aims at waste prevention and re-use, recycling and other recovery of the generated waste and different components. Article 7(2) sets out the targets for re-use, recycling and recovery. Adequate treatment of an end-of-life vehicle includes separation and removal of a lot of different parts that can better be recovered within similar waste streams. These parts are included in the recovery targets set out in Article 7 when recovered.

According to the 2005 report of the Copper Alliance, based on the outlined average weight and copper or copper alloy content, the 11.5 million vehicles deregistered in Western Europe would correspond to a gross weight of 15 million tonnes, including 210 000 tonnes of copper and alloys. The concentration of copper materials in end-of-life vehicle waste streams is bit smaller than in WEEE streams. However, considering the high volume and weight of the waste stream, end-of-life vehicles and their recovery targets may offer a lucrative source and incentives for copper and copper alloy scrap.

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617 See e.g. Van Calster 2015a, p. 229.
618 See Krämer 2016, pp. 393–394.
621 See Krämer 2016, p. 393, for the view that there is problem because the distinction between a used car and an end-of-life vehicle can sometimes be unclear increasing the risk of illegal shipments and inadequate treatment.
622 See Van Calster 2015a, p. 221, for the point that Directive 2000/53/EC well indicates the waste hierarchy set out in Article 4 of the WFD.
623 For example, Annex I to the Directive requires the removal of batteries and glass.
recovery. This waste stream can function as an urban mine for copper because of the high recovery rate involved.\footnote{See e.g. Copper Development Association: Copper in End-of-Life Vehicle Recycling. Center for Automobile Research 2006, pp. 6–9.}

Copper can also be found in construction and demolition waste streams. Copper and brass are extensively used in plumbing, taps, valves and fittings. Furthermore, copper is used for building facades, canopies, window frames, roofing and ornaments. Article 11 of the WFD requires that by 2020 the preparing for re-use, recycling and other material recovery such as backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste (such as non-hazardous copper wastes) shall be increased to a minimum of 70\% by weight. As with all legislation that covers specific waste streams, the recovery target is also purely based on recovering a certain amount of C&D waste as materials. Using EoW copper and copper alloy scrap from the C&D waste streams in the production of new copper products may offer a good means of achieving this target. The fact that copper is often used in specific parts such as plumbing makes separation and eventual recovery simpler. This is normally done in so-called selective demolition processes.\footnote{End-of-Waste Criteria for Copper and Copper Alloy Scrap: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011, pp. 14–15.}

Construction is the biggest individual copper user absorbing over 30\% of total usage within the EU and therefore represents an important source of scrap and an urban mine for copper.

The different provisions on specific waste streams mostly emphasise the weight and volume of the waste streams and the targets are drafted to calculate these. Since the amount of copper can be significant in certain waste streams, the use of weight-based recovery targets may complement the objective of more efficient copper recovery. However, the recovery and recycling targets are not bound to recovering certain fractions of waste streams and therefore the recovered volume might derive from another fraction of the waste stream. Compared to other waste streams, copper and copper alloy scrap is viewed as being high in value. Therefore, it is probable that their recovery will be prioritised over less valuable fractions of waste streams, especially in relation to waste streams such as end-of-life vehicles and demolition waste in respect of which separation and collection is relatively easy and the copper scrap can be found in large quantities. In respect of demolition waste, separate collection and the large quantities of waste available make it a good source of copper scrap despite its relatively small saturation compared to the overall volume of the waste stream.

4.2.3 Waste and non-waste copper

4.2.3.1 End-of-waste and by-product status

Commission Regulation (EU) No 715/2013 regulates the EoW status of copper and copper alloy scrap in material recovery. The Regulation is based on the JRC document and technical proposal for the EoW criteria for copper and copper alloy scrap.\footnote{End-of-Waste Criteria for Copper and Copper Alloy Scrap: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011.} It was adopted on the basis of the comitology procedure, in which no opinion was expressed.
on it during voting. However, the regulation was not objected to by the Council or the European Parliament and entered into force at the beginning of 2014.

Article 1 of the Regulation states that it establishes the criteria determining when copper scrap ceases to be waste. Article 2 sets out the key definitions used in the Regulation, including ‘copper scrap’, ‘holder’ and ‘producer’. Article 3 refers to the EoW criteria for copper scrap, although the specific elements of the criteria are in fact set out in the Annexes to the Regulation. Article 4 requires producers or importers to issue a statement of conformity confirming to the model set out in Annex II. The management system concerning the quality criteria and the copper scrap is set out in Article 5. Article 6 covers the Regulation’s entry into force.

Annex I to the Regulation sets out the specific EoW criteria for copper scrap. Annex II contains a blank form for the statements of conformity referred to in Article 4 of the Regulation. Annex I, on the specific EoW criteria, is divided into three sections: (1) the quality of copper scrap resulting from the recovery operation; (2) waste used as input for the recovery operation; and (3) treatment processes and techniques. Section 2 governs the waste streams that can be used in EoW copper recovery. Article 6 of the WFD provides that ‘waste shall cease to be waste when it has undergone a recovery (including recycling) operation’. Section 2 applies in relation to the quality of the waste streams prior to the recovery operation referred to in Article 6 and states, inter alia, that only waste that contains recoverable copper or copper alloy may be used as input.

Section 1 of Annex I governs the copper and copper alloy scrap that can cease to be waste. It lays down the specific criteria under which copper scrap can cease to be waste. For example, section 1.2 provides that the total amount of foreign materials shall be less than 2 % by weight. Other less specific requirements are set out in respect of copper and copper alloy scrap: section 1.4 provides that the scrap shall be free of visible oil, oily emulsions, lubricants or grease except negligible amounts that will not lead to any dripping. Section 1.6 states that a subject of EoW regulation on copper scrap cannot be considered hazardous waste as referred to in the WFD. In contrast to this, it should be acknowledged that waste material prior to the recovery operation may be considered hazardous where there is proof that the processes and techniques specified within the criteria on treatment and techniques in section 3 of Annex I remove all hazardous properties that applied to the initial waste stream.

Section 3 of Annex I sets out the acceptable treatment processes and techniques for waste streams containing recoverable copper or copper alloy. Section 3.1 requires the copper scrap to have been segregated at source or during collection and requires the input wastes to have been treated to separate the copper scrap from the non-metal and non-copper metal components. Simply put, the copper materials are to be separated from other wastes. Special rules on treatment of hazardous wastes are laid down in section 3.3 and require the removal of potentially hazardous elements from the waste treatment process so that the result is a copper scrap waste stream that does not contain hazardous features following the recovery operation, as required under section 1.6.

628 Emphasis added.
629 For further discussion and the basis on which the percentage was decided, see End-of-Waste Criteria for Copper and Copper Alloy Scrap: Technical Proposals. JRC Scientific and Technical Reports. European Union 2011, pp. 51–56.
Sections 1 and 2 of Annex I also lay down self-monitoring requirements. The quality of copper scrap resulting from the recovery operation is mostly verified through visual inspection of each consignment. The staff that carry out this visual inspection must be qualified for the task. If the visual inspection gives rise to any suspicions, further appropriate monitoring measures must be taken, for example, to determine the possible hazardous features of the waste stream. The waste used as input for the initial recovery operation is also visually inspected by competent staff. Article 2 of the Regulation specifies that visual inspection means inspection of copper scrap covering all parts of a consignment and using human senses or any non-specialised equipment. The visual inspection is referred in the self-monitoring requirements of section 2 of Annex I. Both sections 1 and 2 refer to the same kind of inspection. No self-monitoring requirements are laid down in respect of treatment processes and techniques. The ability to carry out a visual inspection instead of more intensive quality control methods substantially reduces the costs involved.

The waste copper or copper alloy scrap ceases to be waste if it fulfils the detailed criteria set out in Annex I together with the provisions contained in the main body of the Regulation. The visual inspection of the scrap verifies that the real properties of the scrap comply with the standards and no control mechanisms additional to those laid down in the Regulation are required.

However, EoW status is only a secondary status for copper materials that have already become waste and then cease to be waste after the recovery operations. The ability to consider copper scrap as a by-product would benefit the efficiency of the recovery scheme on an even greater scale. Whether copper scrap can be considered a by-product largely depends on the production process used. The decisive issue for by-product status is that the copper must be produced as an integral part of a production process and constitute a production residue and not a product in itself.

Copper scrap could, for example, be a by-product of a factory producing semi-fabricated copper products. If it fulfilled the by-product criteria it would be classified accordingly. The EoW criteria could not be applied to it prior to its being classified as waste. By-product and EoW status rarely conflict, given that by-product status only applies to production residues. By-product status could provide a smaller circulation for the metal scrap than EoW criteria as it would avoid problems with the collection and separation of the waste. Most of the time by-product status does not function on such a big scale as EoW status but provides a good smaller material loop for producers that generate waste that can be utilised directly in their production processes without intensive pre-processing. As noted above, by-product status is more of a waste prevention incentive than an incentive for waste recovery.

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630 Article 4 of the Regulation states that consignment means a batch of copper scrap which is intended for delivery from a producer to another holder and may be contained in either one or several transport units, such as containers.


632 Recovery entails that the subject material is considered waste and by-products are not.
4.2.3.2 Non-waste copper scrap

If copper scrap fulfils the criteria of either by-product or EoW status, it is not considered waste and does not fall within the scope of application of the waste legislation. Regulation (EU) No 715/2013 provides that after recovery scrap that fulfils the criteria laid down in section 1 of Annex I to the Regulation is no longer considered waste. However, the quality criteria laid down in section 1 still determine the appropriate quality of non-waste copper scrap. For example, copper scrap with visible oily emulsions that could lead to dripping are still considered waste prior to their cleaning due to the requirements of section 1.4 of Annex I.

Other legislative frameworks may also have significant impacts on the utilisation of copper scrap. After the copper scrap ceases to be waste, it can be considered a substance, mixture or article within the meaning of REACH, which specifies that pure metal such as copper or copper scrap alloy is considered a substance even when it contains few impurities or is recovered from waste. The substance must be registered if it has not been registered before and if insufficient safety information is available.

The difference between copper and copper alloy scrap is that alloys are considered as special mixtures and as such subject to registration under REACH. The main rule is that different mixtures (or alloys) of metal require different registration as they should be considered separate substances. Nevertheless, it should be taken into account that unintended impurities of the recovered copper or copper alloy streams do not require separate registration. Constituents present in quantities above 20% should however not be considered as impurities but as separate substances. The limit of 20% is not absolute and impurities can be considered as separate substances even in smaller quantities in the event that the recovered material is intentionally selected for the presence of that constituent.

According to REACH, the recovered metal may be (1) a mono-constituent substance where at least 80% of the metal is the metal, in this case copper; or (2) a mixture, where there are smaller quantities of the main metal substance. The criteria set out in section 1 of Annex I to Regulation (EU) No 715/2013 limit the content of the copper scrap by ensuring that lower-quality copper scrap will still be considered waste. There are two options for the registration of copper and copper alloy scrap under REACH: (1) registering mono-constituent copper substance where all other constituent qualify as impurities; or (2) registering copper alloys where the other metals such as zinc or tin are also considered to be subject to the registration obligation. Numerous copper products have already been registered in the REACH database.

633 Despite this, EoW materials can be counted towards recovery and recycling targets contained in both the WFD and in the legislation on specific waste streams.

634 Unlike pure metals, which usually require registration, minerals, ores, and ore concentrates are exempt from registration requirement under point 7 of Annex V of REACH unless they have been chemically modified.

635 Article 2(7) of REACH.

636 At this point, this is also up to the other content of earlier registrations.

The assessment of sameness between recovered copper scrap and a substance that has already been registered needs to apply the guidance on substance identification and the guidance on data sharing: variation in the composition or the impurity profile does not necessarily mean that the substances are different and require new registration. As mentioned above, a certain level of sameness is automatic due to the EoW criteria for copper and copper alloy scrap. A limited number of necessary registrations should be ensured through the EoW criteria restricting the potential candidates for ceasing to be waste. However, the use of EoW copper would still require access to the safety data in order to fall under the recovery exemption set out in REACH.638

Adequate REACH registrations for copper mono-constituent substances as well as copper mixtures can be used as controlling mechanisms to address the potential impacts on the environment and on human health of using waste-based copper. However, it must be taken into account that the provisions governing EoW status for copper also limit the allowable quantities of foreign substances and the features of copper waste and it is unlikely that low-grade copper products with a high level of impurities can cease to be waste. As the additional control measures and bottlenecks are largely based on the unknown properties and heterogeneity of the waste materials, the recovery exemption and the data sharing could constitute grounds to remove the over-inclusive precautionary measures involved in using the waste-based material. In addition to REACH, all other regulation subject to similar products would start to apply to the EoW materials after they cease to be waste.

4.2.4 Shipments of copper

Levels of imports of copper scrap into the EU have varied between 200,000 to 400,000 tonnes per year with an increase of 26% between 2004 and 2008. Despite this increase, the EU is a large net exporter of copper scrap.639 In transboundary waste shipments, most scrap metals are contained in the green list. Pursuant to Regulation (EC) No 1013/2006, the inclusion of a waste in the green list requires the completion of a form. However, this requirement does not apply to copper and copper alloy scrap that is no longer considered waste following fulfilment of the applicable EoW criteria.

After EoW-quality copper and copper alloy scrap have undergone a recovery operation, they are considered non-waste and may circulate freely in the internal market as non-waste materials.640 Due to the fact that most scrap metals were already destined for recovery and considered as green list wastes despite their waste status, this does not involve that big a difference in terms of waste shipments. Nevertheless, providing even easier access to internal market and enabling the transportation of copper scrap should bring about a better functioning market and offer a more efficient solution for the recovery of copper scrap at EU level. Establishing a functioning market for recovered copper inside the EU could provide the EU with a significant market

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640 Waste materials may also move relatively freely within the internal market but the extra regulation on waste shipments still applies to substances and objects while they are still considered waste.
boost in view of the export quotas and tariffs in place in respect of the copper trade with China, Russia and Ukraine.\textsuperscript{641}

The amount of transported copper wastes is increasing. This generally holds true for both intra-EU transportation and transportation to third countries.\textsuperscript{642} The Regulation on the EoW status of regulating copper and copper alloy scrap allows the copper scrap that fulfils the applicable criteria to circulate freely within the EU. If the criteria cannot be fulfilled, the procedure for green list waste shipments is likely to apply. Article 28 of Regulation (EC) No 1013/2006 provides that in situation where there is disagreement as to whether the substance or object is considered waste in the importing country, it shall be considered waste. The same kind of logic should be applied in relation to the exportation of EoW products out of the EU’s internal market, and in relation to the importation of waste-based non-waste products into the EU. Nevertheless, if no EU-wide EoW criteria have been laid down and there is disagreement on whether the substance or object is waste, it shall be regarded as waste. Hence EU-wide EoW regulation does not necessarily apply outside the Member States. Nevertheless, outside the EU, third countries may legislate in a different manner on the concept of waste and on waste management in general.

4.2.5 Reduced bottlenecks

Certain barriers or bottlenecks restrict the use of substances or objects classified as ‘waste’ in production processes. Many of these barriers are made to create additional control measures to ensure a high level of protection of the environment and of human health. However, these rules do not necessarily serve a purpose or actually prevent the environmental and human health impacts of waste. The main benefits of the materials ceasing to be waste lie in lightening the regulatory burden and reducing the costs involved in their utilisation. In order for the applicable provisions on EoW status to achieve the objective of lightening the excess regulatory burden, the legislative framework on similar products should provide a lighter regulatory burden and the regulation of EoW should not require an excessive amount of administrative control or costly monitoring. The provisions governing substances and objects post-waste is a combination of the legislation applied to similar non-waste products and the provisions laid down in EU or national EoW legislation and decisions made on a case-by-case basis. In general, product regulations govern the quality of the product while the provisions on qualifying for EoW status ensure that the waste stream ceasing to be waste is clean and homogenic.

EU-wide EoW criteria for copper and copper alloy scrap create a clear differentiation between high quality copper scrap and low quality scrap.\textsuperscript{643} Separating the two makes the distinction between waste and non-waste status of copper scrap clearer: high-quality copper scrap should not be considered as waste, but low-quality scrap


\textsuperscript{642} EEA reports No 7/2012: Movements of waste across the EU’s internal and external borders. Copenhagen 2012, p. 23, table 4.1.

\textsuperscript{643} See Monitoring impacts from Council Regulation (EU) No 333/2011: End-of-waste criteria for Al/Fe scrap. JRC Scientific and Technical Reports. European Union 2014, p. 113, for the point that EoW regulation also seems generally to improve the quality of scrap metals.
certainly should be. To ensure this, the monitoring and control mechanisms that apply following EoW must be clear and enforceable. The credibility and legal certainty of the distinction between non-waste and waste copper scrap depends on the enforceability of the quality standards.\textsuperscript{644} The EoW provisions that ensure the quality of the recovered copper scrap serve the purpose of protecting the environment and human health. It is clear that the use of high quality waste streams does not pose risks of a kind that need to be regulated under the legislative framework on waste.

EoW criteria also improves the functioning both of the internal market and of the external markets of the EU through harmonised rules within the Member States, increased legal certainty on the waste status of the material, increased transparency, and reliable information on the quality of the materials that are being shipped.\textsuperscript{645} EoW regulation can be useful in that sense too: it creates a quality standard under which the material in question ceases to be waste. The minimum quality standards in respect of EoW products are commonly known by importers and exporters as well as being legally regulated. This kind of quality assurance assists the marketing and sale of non-waste copper scrap in the internal market.\textsuperscript{646}

The reduction of regulatory burdens in respect of shipment and trade in copper and copper alloy scrap should be carried out only to the extent that the utilisation of environmentally safe materials and products should not be subject to unwarranted monitoring or control. The circular economy scheme aims to promote \textit{clean material cycles} where the regulatory burden can be lightened without environmental or human health risks by removing unwarranted measures.\textsuperscript{647} The use of recovered copper scrap does not pose a threat to the environment or to human health and its removal from waste status does not require an extensive amount of quality control.

The provisions on the quality of the copper and copper alloy scrap contained in Annex I to Regulation (EU) No 715/2013 mostly focus on the impurities and foreign substances mixed with the copper scrap. The need to control foreign substances within the waste streams should always be taken into account in relation to drafting provisions on EoW status if these foreign substances may form part of the regulated waste stream. Foreign substances are barriers to the recovery of the waste material and, due to their possible multiplicity, it is very hard to legislate in advance as to the impacts they may have on the environment and on human health.

The reduction of the above-mentioned bottlenecks has the potential to have significant economic and market impacts. Most of the time it is also clear that the costs involved in scrap treatment will reduce in terms of permits and licences in relation to waste treatment. Greater legal certainty as regards the utilisation of copper scrap also increases its long-term availability and helps to develop the strategy of the European copper industry. EoW regulation of copper scrap reduces the administrative costs of


\textsuperscript{645} See Monitoring impacts from Council Regulation (EU) No 333/2011: End-of-waste criteria for Al/Fe scrap. JRC Scientific and Technical Reports. European Union 2014, p. 113, for the point that in addition to legal certainty and higher quality scrap, it appears that EoW regulation could also increase flexibility in production by widening the range of available sources of raw materials and production methods.


using copper in recovery processes and production, thus making copper scrap more competitive compared to primary copper materials. Before the introduction of EoW status, the waste status of copper affected its exportability and entailed an increased risk of disagreements between governing authorities.648

Besides reducing the administrative costs involved in using recovered waste-based materials, the general quality and management framework offered by EoW regulation can save significant costs in trading. It should be noted that the quality assurance provided by EoW status does not come for free and that additional costs must be incurred to ensure compliance with the applicable EoW regulation. However, the quality of the scrap involved is assured through its being subject to product legislation. Therefore, these compliance costs are not predicted to have a big impact on the price of scrap.649 The EoW criteria laid down in Article 6 of the WFD limit the scale of possible EoW candidates to substances and objects that can either be used safely in a recovery operation or substances and objects whose hazardous features can adequately be controlled under product legislation that takes the place of waste legislation after the substance or object ceases to be waste.

In order for EoW regulation to function properly, the regulatory burden and costs of using the material has to be reduced when the waste ceases to be waste, thus creating a level playing field between waste-based and virgin raw materials. This should increase the demand for waste-based materials as they are often cheaper than virgin raw materials. There are clear benefits to using recovered copper scrap to substitute virgin raw materials, and Regulation (EU) No 715/2013 lightens the regulatory burden involved in using recovered copper while at the same time offering environmental benefits. The quality assurance involved in using copper scrap is quite light and is mostly based on controlling the amount of foreign substances in the scrap. The application of EoW regulation can be extremely beneficial in relation to waste streams that can provide a clean cycle in waste management and in this way serve the objectives of the circular economy and the waste hierarchy.

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4.3 MATERIAL RECOVERY OF RARE EARTH ELEMENTS

4.3.1 Introduction

A rare earth element or rare earth metal refers to one of 17 elements of the periodic table defined as rare earths by the International Union of Pure and Applied Chemistry (IUPAC). Rare earths are, in spite of their name, not very rare in the Earth’s crust. They have a tendency to occur together in nature and are difficult to separate from each other. Nonetheless, they are not often found in large concentrations in economically exploitable ore deposits due to their geochemical properties. In its circular economy action plan the Commission refers to rare earth materials in the section on critical raw materials. The heavy and light rare earth elements are considered critical raw materials based on their yet unreliable supply and poor recovery rates. The Commission states that these materials (rare earths and other precious metals) are of high economic importance to the EU, vulnerable to supply disruption, and that, in some cases, their extraction has significant environmental impacts. The leakage of critical raw materials from Europe is problematic both environmentally and economically, particularly if a balance between the two interests cannot be achieved in relation to rare earth materials.

Rare earth elements are extremely important in modern technology. For example, scandium is used in aerospace frameworks, high-intensity street lamps and high-performance equipment. Yttrium is used in TV sets, cancer treatment drugs, and to enhance the strength of alloys. Lanthanum is used in camera lenses, battery-electrodes and hydrogen storage. Neodymium is utilised in extremely strong permanent magnets, microphones, the electric motors of hybrid automobiles, and lasers. In addition, rare earths are used in the lithium batteries of electric-hybrid cars and are an irreplaceable input in modern aircraft production. An estimated one kilogram of rare earth elements can be found inside a typical hybrid car. They are also used in energy efficiency and renewable energy technologies. In current technology, it

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650 These materials are fifteen lanthanides, Cerium (Ce), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), holmium (Ho), lanthanum (La), lutetium (Lu), neodymium (Nd), praseodymium (Pr), promethium (Pm), samarium (Sm), terbium (Tb), thulium (Tm), ytterbium (Yb), and scandium (Sc) and yttrium (Y). Scandium and yttrium are considered rare earth materials due to their tendency to occur in the same ore deposits as the lanthanides and possess similar chemical properties.
651 With the exception of promethium.
653 COM (2014) 297 final, p. 7. It should be noted that critical raw materials are not the only materials that call for more efficient recovery, but are those that are affected by serious problems as to reliable supply; Koltun, P. & Tharumarajah, A., ‘Life Cycle Impact of Rare Earth Elements’, ISRN Metallurgy, Vol. 2014 (2014), p. 1, for the following list of light rare earth elements (LREEs): lanthanum (La), cerium (Ce), praseodymium (Pr), neodymium (Nd) and promethium (Pm) and the heavy rare earths are terbium (Tb), dysprosium (Dy), holmium (Ho), erbium (Er), thulium (Tm), ytterbium (Yb), lutetium (Lu), scandium (Sc), and yttrium (Y).
654 See COM (2015) 614 final, p. 10, for the point that leakage of high-value waste streams should be prevented.
is very difficult or impossible to substitute the rare earth materials and still obtain their main function. The Commission calls for further encouragement of separate collection of different waste fractions and development of market mechanisms. On top of that, preventing illegal exports and inappropriate treatment of waste can lead to considerable environmental benefits and to the recuperation of valuable materials. Rare earth metals are essential for development and even for keeping up with the current stage of development: rare earths are not just important for manufacturing products, but also for human health and life in terms of cancer medicines and other medical treatments and applications.

Rare earth ore deposits can be found in Europe but the greater proportion of deposits are outside Europe, making Europe dependent on external imports of rare earth materials. Rare earths are utilised in relatively tiny quantities but they are increasingly essential to the development of technologically sophisticated products in view of the growing number of functionalities that are required. Innovations and technical development are crucial in terms of sustainable production and achieving the objectives of the circular economy.

The life-cycle of rare earth elements can result in severe impacts on the environment and on human health if not managed properly. For example, rare earth materials contain some radioactive isotopes. The major concerns regarding radiation caused by rare earth materials relate to thorium production. Recovered, secondary, rare earth elements do not contain radioactive thorium and uranium but virgin, mined, rare earth ores do contain these substances. The mining of rare earth has a big impact especially on water even compared to the extraction of other metals. In addition to the threat of radioactivity, the use of rare earth elements may pose other threats to the environment and to human health that relate to their potential for acidification, toxicity and to their other harmful properties. Potential impacts on the environment and on human health should be taken into account in regulating rare earth elements and products that contain rare earths.

658 COM (2008) 699 final, p. 3. If substitution of rare earth materials with other materials is not possible, the manufacturer is highly dependent on the supply of raw rare material streams or waste streams containing recovered rare earth elements.
660 See ‘Growth within: A circular economy vision for a competitive Europe’, Ellen MacArthur Foundation 2015, p. 26, for the point that the virtualisation of products and production is an important aspect of achieving the objectives of the circular economy. For example, replacing hundreds of books with a screen such as Kindle preserves a huge amount of paper but also requires the production of the technical product.
661 Koltun & Tharumarahaj 2014, pp. 2–9. See e.g. Li, Xiaofei et al., ‘A human health risk assessment of rare earth elements in soil and vegetables from a mining area in Fujian Province, Southeast China’, Chemosphere 93 (2013), pp. 1240–1246
4.3.2 Recovery of rare earths

4.3.2.1 Technological possibilities to recover rare earth elements

The recovery rate in respect of rare earth materials is currently very poor. Some products do not enter rare earth recycling loops due both to the limited quantity of rare earth elements that they contain and to separation issues (catalysts, glass and alloys). There is technology available to deal with rare earth elements in ceramics, some phosphors in lamps, batteries and, in particular, electrical car batteries. The development of magnet technologies may also offer the ability to separate rare earth elements. Rare earth elements can be found in many different waste streams but it would seem that their use is most common in high-tech innovations such as electronics and, for example, hybrid vehicles. Rare earth elements are usually utilised in the form of compounds, usually oxides, chlorides or carbonates. These three are referred to as rare earth oxides (REOs). Basically, the need for supplied rare earth materials can be satisfied by one or more of the following means: (1) developing re-use and recycling to generate secondary supplies; (2) stockpiling, which does not increase supplies but aims at overcoming supply shocks; and (3) research and development on substitute technologies.

Rare earth elements often follow the normal life-cycle of a product. First, it becomes part of the in-use stock of metals. Second, it reaches its end-of-life point and becomes waste after being discarded pursuant to Article 3(1) of the WFD. Third, after becoming waste, it is either (1) included in a spent product that is not collected or improperly recycled, but enters into an open life-cycle; or (2) properly collected (pre-processing), and enters into a closed life-cycle when effectively recycled. After these stages the metal can return to production as a secondary material. The recovery can be further divided into functional recycling, where the metal is returned to raw material production; and non-functional recycling, which results in materials where specific metals are not separated. Functional recovery is preferred over bulk recycling as the value of REO’s depends on their purity.

In view of the properties and usage of rare earth the procedure outlined above is now regarded as a rather outdated and inefficient method of recovery. There are some waste streams in respect of which the separation and recovery of the rare earth fractions is more developed and has reached an economically viable operational stage but for most waste streams the separation of rare earths is still troublesome. The waste streams that are developed in harnessing secondary rare earths include the recycling of permanent magnets, lamp phosphors, and nickel metal hydride batteries. The recovery of rare earth materials for magnetic purposes of use is somewhat simple as they are often shredded but still retain their magnetic properties. Depending on the

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664 See ‘Recovery of Rare Earths from Electronic wastes: An opportunity for High-Tech SMEs’, European Union 2014, p. 14; UNEP International Resource Panel (2011), ‘Recycling Rates of Metals: A Status Report’, for the point that the recycling of rare earth materials is still very limited (less than 1 %) and there are only a few companies in Europe that are actively involved in such recovery.

665 Library of the European Parliament 02/05/2013: Rare earth elements and recycling possibilities, p. 5.

666 Library of the European Parliament 02/05/2013: Rare earth elements and recycling possibilities, p. 3.

667 Library of the European Parliament 02/05/2013: Rare earth elements and recycling possibilities, pp. 2, 4.

quality and concentration of the desired secondary product the rare earth elements can be separated prior to shredding.

4.3.2.2 Recovering components and chemical compounds

The recovery of rare earth elements fits well into the first category of recovery operations where waste-based materials are substituted for virgin materials and fulfil their functions. Recovered rare earths can be used as a secondary stock to meet the demand on the market. Recovery may mean preparing for re-use where rare earth materials are recovered as a functional entity, for example, as a magnetic circuit; or a recycling operation if rare earth elements are separated from the original parts. Separate rare earth elements of the product can be extracted as alloys and individual rare earths.

Preparing for re-use usually refers to utilising components that contain rare earth in similar products as such components cannot be modified by means of heavy processing processes in preparing for re-use. Preparing components containing rare earths for re-use does not directly add to the secondary supply stock of rare earth materials, because in re-use operations the rare earth components are in closed-loop circulation and not available for different purposes of use. However, re-use increases the material efficiency and self-sufficiency of the critical raw material supply.

Recycling offers wider possibilities in terms of purposes of use but recovering functional elements is usually more efficient in terms of pre-treatment and energy consumption. For example, there are clear environmental benefits to be gained by recovering rare earths from permanent magnets and rare earth-based phosphors. Using the components is crucial in recovering rare earth from product such as fluorescent lamps, in which the components that contain rare earth materials are practically or completely irreparable. Nonetheless, in many cases it is common that the treatment of the waste (e.g. shredding of electronic waste) obviates the possibility to re-use the components.

Separation of rare earth elements through recycling processes offers better possibilities to create a secondary stock of waste-based materials than does preparing for re-use. It also provides better incentives for future innovation as it does not require the use of the same functional components. Nevertheless, as it is an intense recovery process, recycling tends to involve greater energy consumption and has a

669 Some rare earths can also be recovered in other recovery operations such as energy recovery. In these situations, rare earths could theoretically be restored from the ashes.


heavier impact on the environment than preparing for re-use. However, due to the fast development of technology and shorter life-cycles of its products, repairing products is not that common. Despite that, the same components or the same chemical compounds could be used to produce a replacement for the product that has been disposed of.

The composition and source of the rare earth elements have an important effect on the processes needed for their efficient recovery. However, the treatment of waste streams that contain irreparable components or old technology does not offer the possibility of preparing the components for re-use. The rare earth elements involved can still be subjected to recovery operations comprising recycling in which their chemical compounds (oxides) can be separated using chemical, magnetic or other separation mechanisms. Since there are key differences in the recovery of rare earth elements from different products, this notion can only be used as a general guideline for the priority order for different waste treatment options.

The biggest problems with the concepts of recovery, preparing for re-use and recycling is that they do not differentiate between recovering the overall product (and all its components) and simply recovering the rare earths in the products. Without a life-cycle assessment the options that have better environmental outcomes are not prioritised. It is possible that in a particular recovery process the rare earth elements are not recovered even though the greater fraction (by weight) of the waste stream is recovered. A well-established recovery route could offer the producer advantages in terms of a smaller environmental footprint and cheaper sources of materials compared to primary production.

4.3.3 Recovery targets

The circular economy strategy aims to stop the leakage of critical raw materials and provide a secondary supply for materials through more efficient recovery loops. The legislative framework that applies at different stages of the product’s life-cycle lays down sub-objectives within this main target of reaching the stage at which the loop for rare earth elements will be closed within the internal market. The WFD regulates rare earth elements and their recovery. Since rare earths are often used

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674 Kooroshy et al. 2015, p. 54.


676 E.g. melting down a television to produce recycled plastics can be considered a recycling operation, as can extracting the rare earth materials before the recovery of the whole product.

677 Kooroshy et al. 2015, p. 48.

678 See Kalimo 2006, pp. 207–209, for the observation that it is never simple to apply life-cycle thinking to production processes and waste management in a comprehensive manner, because even the longest possible life-cycle does not always provide the best environmental outcome in terms of waste treatment.

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in small concentrations in electrical or high-tech appliances, their recovery can fall under the scope of application of the relevant sectoral waste legislation. In respect of rare earth materials, this is likely to mean that the following directives, all of which feature legal provisions on specific waste streams containing rare earths, have an important influence on the recovery of rare earth materials: the WEEE Directive; Directive 2006/66/EC, which covers batteries and accumulators and waste batteries and accumulators; and Directive 2000/53/EC, which covers end-of-life vehicles.679

The WEEE Directive provides that the collected waste electronics shall be treated, recycled or recovered in accordance with the best available techniques. The Directive lays down recovery targets and creates a financing mechanism for the collection and recovery of WEEE. The fulfilment of the recovery targets for electronic waste is based on concepts such as recovery, preparation for re-use and recycling.680 The Directive lays down certain provisions on separating different substances from the product but the recovery schemes mostly concern recovery percentages by total weight of the waste stream and its recovered parts.

Directive 2006/66/EC requires batteries and accumulators to be dealt with in a different manner due to the dangerous substances they contain. In addition to the regulation of waste recovery, the Directive also covers product stage batteries and accumulators and requires separate collection and safe treatment of waste batteries and accumulators. The collection and treatment of the waste streams can be carried out through extended producer responsibility schemes if a Member State wishes to use this option.681 The Directive contains provisions on minimum collection rates and minimum recycling efficiency and has the main objective of minimising the negative environmental impacts of batteries and accumulators while preserving a functioning internal market.682

Directive 2000/53/EC covers waste prevention and re-use, recycling and other recovery of the generated waste and different components in relation to discarded vehicles. However, vehicle batteries fall within the scope of application of Directive 2006/66/EC after they are separated from other waste streams.683 Adequate treatment of an end-of-life vehicle includes separation and removal of a lot of different parts that can better be recovered within similar waste streams.684

The steps taken towards the circular economy are mostly indirect.685 The sectoral provisions on specific waste streams mostly focus on calculating the weight and volume of the waste streams. However, since rare earths present themselves in small quantities in electrical or high-tech appliances, their recovery can fall under the scope of application of the relevant sectoral waste legislation. In respect of rare earth materials, this is likely to mean that the following directives, all of which feature legal provisions on specific waste streams containing rare earths, have an important influence on the recovery of rare earth materials: the WEEE Directive; Directive 2006/66/EC, which covers batteries and accumulators and waste batteries and accumulators; and Directive 2000/53/EC, which covers end-of-life vehicles.679

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679 See Library of the European Parliament 02/05/2013: Rare earth elements and recycling possibilities, p. 4: For example, the motor of an electrical vehicle contains up to 30 kilograms of rare earth elements.
680 See e.g. Van Calster 2015a, p. 229.
681 See Van Calster 2015a, p. 215, for the observation that this option has not been overwhelmingly chosen in Member States.
682 Recitals 1 and 16. See Krämer 2016, p. 388.
684 For example, Annex I to Directive 2000/53/EC requires the removal of batteries and glass.
quantities\textsuperscript{686} and the targets do not prioritise their recovery over the recovery of the more common fractions of the overall waste stream, there are no real legal obligations on removing or separating rare earth elements.\textsuperscript{687} De Römpf also argues the recovery targets should aim at encouraging qualitative recycling instead on recovery target based on the overall volume of waste.\textsuperscript{688} The use of weight-oriented recovery schemes is well-founded in quantitative terms but these schemes offer no incentive to carry out economically and environmentally efficient recovery operations on a large scale.\textsuperscript{689} The European Environmental Bureau has called for additional efforts to be made to take environmental factors into account in the targets.\textsuperscript{690} The economic factors involved in the supply of rare earths may be essential in terms of developing the recovery market for rare earth elements. Therefore, many operators might benefit greatly from having a secondary supply of waste-based rare earth elements at their disposal. However, as long as recovered rare earths are not an economically competitive alternative to imported virgin rare earths the significance of the secondary supply is marginal.

\subsection*{4.3.4 Waste status and its exclusions}

Rare earth materials that are declassified as waste fall under the legal provisions laid down in respect of the products – and not the particular components of those products – in which they are used. Both sets of criteria for non-waste status can apply to rare earth materials or to waste streams containing rare earths. For example, rare earths can be found in some mining by-products\textsuperscript{691} and in the ashes of municipal solid waste that has been burned.\textsuperscript{692} Many of the waste streams containing rare earths could potentially cease to be waste, at least in certain situations, if the political will to legislate on the matter existed. Nonetheless, there would only be limited scope for by-product or EoW status to aid the recovery of rare earth elements. The real impediment to efficient recovery of rare earth waste streams does not lie in its waste status, but in the fact that technical and economic issues make such recovery difficult in practice.\textsuperscript{693}

Legal provisions governing the declassification of waste usually apply to waste streams that are already in a functioning recovery scheme. This can be a low risk

\begin{itemize}
\item \textsuperscript{686} See Library of the European Parliament 02/05/2013: Rare earth elements and recycling possibilities, p. 4, for point that a smartphone includes estimated quantities of 50 milligrams of neodymium and 10 milligrams of praseodymium in its loudspeakers.
\item \textsuperscript{687} Kalimo 2006, pp. 252–253.
\item \textsuperscript{688} De Römpf 2018, pp. 358–360.
\item \textsuperscript{690} Lymberidi, Elena, ‘Towards Waste-Free Electrical and Electronic Equipment’, European Environmental Bureau 2001, p. 29.
\item \textsuperscript{691} Kooroshy et al. 2015, pp. 39.
\item \textsuperscript{692} Fly and bottom ashes of energy production can also be used for different purposes. See Pan, Jill R. et al., ‘MSWI bottom and fly ash as raw materials for Portland cement’, \textit{Waste Management} 28 (7) 2008, pp. 1113–1118, for the point that the ashes can, for example, be used in cement production as a low cost substitute clay components.
\item \textsuperscript{693} Kooroshy et al. 2015, pp. 48, 53.
\end{itemize}
and low reward regulatory strategy but is backed up by the fact that both sets of criteria require certainty of use in a specified purpose of use.\textsuperscript{694} Non-waste status is not available to the substance or object if its use cannot be ensured. It is quite hard to legislate on or assure use in respect of most rare earths, given that they generally form small fractions of mixed waste streams from which they can either be recovered as parts or solutions.

The barriers to recovering rare earth elements do not appear in the potential bottlenecks that might appear after the rare earth stream is separated from the bigger waste streams, but in the separation stage itself. Many waste streams containing rare earth materials are collected fairly efficiently. Nevertheless, there are numerous reasons for the poor separation of the rare earth materials: the process may be technically highly complicated, require extensive expertise on the subject, be expensive, or be simply unprofitable in the light of the prices of virgin materials. It is clear that further innovation is needed in order to recover rare earths more efficiently and that, in particular, technical innovations in waste treatment and product design are key to the development of better separation techniques. Of course, regulatory innovations could speed the process up significantly.

That said, the separation of rare earth elements as non-waste fractions of waste streams is a possibility. As rare earth elements are seldom recovered as pure rare earths but as chemical compounds or as components containing quantities of rare earth elements, the end-of-waste criteria for recovered rare earth elements could function as a standardisation scheme as regards the quality of the secondary rare earth compounds and components. However, their recovery can be somewhat complicated due to their varying properties. Because some rare earths pose serious environmental and human health risks, it is not clear without extensive scientific research whether they should be removed from the scope of the additional control measures laid down in the waste legislation.

However, if a more specific legislative framework containing an adequate control and monitoring mechanisms were to come into existence, such a departure from waste status could be possible. The rare earth materials could be regulated under REACH but that would require the use of over a tonne of such materials in operations per year.\textsuperscript{695} For smaller operators or for those involved in industries that only use small quantities of rare earth (e.g. electronics), this could mean that REACH did not apply and would not, therefore, provide adequate control mechanisms to justify exemption from the scope of the concept of waste.\textsuperscript{696} Registrations for rare earths are carried out by the Rare Earth Compounds REACH Consortium, which provides the safety data.


\textsuperscript{695} REACH Article 6(1).

\textsuperscript{696} Recovery of Rare Earths from Electronic wastes: An opportunity for High-Tech SMEs. European Union 2014, pp. 7, 13. At global level, the demand for rare earth oxides in 2008 was estimated at around 120 tonnes. Therefore, in many operations, it is likely that less than one tonne of rare earth oxides is handled per year. See also ‘Study on Rare Earths and Their Recycling: Final Report for the Greens/EFA Group in the European Parliament’, Öko Institut 2011, p. 83, for the point that in 2014 the use of rare earth oxides was expected to increase to around 170 000 to 200 000 tonnes.
required for recovery exemption in respect of EoW status. However, more unusual alloys or alloys with more impurities might require separate registration.

If a regulation on rare earths declassifying waste would be enacted, it could apply to rare earths that are separable from the products in which they are used after the product’s life-cycle has been completed. Their reusability or regeneration potential wholly depends on the properties of the material. However, as take-back infrastructure is lacking, the recovery of small quantities of rare earth from a larger waste stream is inefficient and often not economically viable. Better separation of rare earths could potentially be the subject of legislation that addresses specific waste streams, such as the WEEE Directive.

4.3.5 Shipments of waste

Illegal as well as irrational shipments of waste can be severe problems in terms of preventing the leakage of critical raw materials from the EU. Illegal shipments are sometimes made due to difficulty in distinguishing between a waste and a product. For example, it can be particularly difficult to distinguish a used car from an end-of-life vehicle or a used electronic appliance from WEEE.

A couple of waste streams containing rare earth materials have created certain problems in relation to their shipment. WEEE streams and end-of-life vehicles present a problematic situation where it is very hard to know whether they should be considered waste or a product. Nonetheless, if these wastes are subjected to recovery operations, they shall be considered waste. It can be argued that the important factor in drawing a line between waste and products are environmental factors. However, taking a formalistic approach to this distinction means that the decisive issue is that of whether the material in question is discarded or destined to be discarded (on the basis of a legal requirement or the intention of the holder). Identifying waste streams in waste shipments is crucial in terms of preventing the leakage of material. Applying Regulation (EC) No 1013/2006 to WEEE streams and end-of-life vehicles can lead to the establishment of a relatively important difference in terms of adequate waste treatment of the sources and may help reduce the leakage of critical raw materials. A clearer concept of waste could be beneficial in relation to the recovery of rare earth elements although the exclusions set out in Articles 5 and 6 of the WFD seem to offer very little by way of incentive towards achieving more efficient recovery of rare earth elements.

The provisions of Regulation (EC) No 1013/2006 do not effectively control and impact on the recovery of rare earth elements or prevent the leakage of critical raw materials from the internal market. The Regulation prohibits the export of

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697 Existing registrations by the Consortium: http://www.rare-earth-consortium.eu/substances. See Article 2(7) of REACH.
699 See Kalimo 2006, pp. 300–301.
700 Article 3(1) of the WFD.
701 However, these provisions are drafted on the legal basis of environmental protection and controlling the internal market or possible material leakages from it.
hazardous waste from a Member States to non-OECD countries. This prohibition is not directly connected to controlling the leakage of critical raw materials or rare earths even though hazardous waste streams can be shipped for recovery from the EU’s internal market to another OECD country. Nevertheless, the leakage of critical raw materials is regulated indirectly through the Regulation on waste shipments as it forbids the shipment of waste to third countries for disposal. This rule is designed to ensure that control over waste streams destined for disposal remains in the hands of the EU and the Member States. However, the scope of the legislation is limited to disposal operations or hazardous wastes and it lacks binding obligations concerning the recovery of waste.

4.4 SUMMARY ON MATERIAL RECOVERY

Material recovery from waste is crucial from the point of view of the circular economy. If the aim is to minimise the impacts on the environment and on human health and the amount of waste, it is logical to press for recovery operations where the waste substitutes for another material so that it starts a new life-cycle. Recovery options following which the waste materials can be used again and again are usually the most beneficial both financially and environmentally.

Copper scrap has a long-established market based on recovered copper and special legislation has been enacted to lay down the EoW criteria for copper and copper alloy scrap. The same is not true for secondary rare earth elements: rare earth elements are used in small quantities, are difficult to separate from the rest of the product, and do not have an established market. Exclusions from the concept of waste provide significant possibilities for operators using waste in their production processes, in terms both of reducing the regulatory burden and the costs involved, to use secondary raw materials instead of virgin materials in their production. The legal standard for high quality waste materials also seems to create certainty in sales contracts and in relation to the industrial use of waste materials. Quality assurance can function as an instrument for the creation of an efficient market for the waste material as well as the creation of an oft-necessary distinction between waste and non-waste in administrative permitting processes. Because copper scrap has long enjoyed well-established markets and growing demand, copper scrap could be and has been widely used as a substitute for virgin copper. Therefore, it could fulfil the criteria for EoW status and the regulatory burdens hindering its trade and use could be removed.

However, the concept of waste and its exclusions cannot mould the collection and separation schemes in respect of waste and therefore waste streams with adequate recovery routes are those that benefit from these legislative provisions. Recovery routes for secondary rare earth elements have not yet been developed to enable large

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702 See EEA Reports No 1/2009, ‘Waste without borders in the EU? Transboundary shipments of waste’, p. 6, for the point that this rule stems from the assumption that non-OECD countries usually do not have proper and sufficient treatment capacity in place.
scale recovery of the materials. The high value of, and demand for, the copper scrap and the fact that it is easy to collect and separate in a profitable way are the main reasons for its efficient recovery.

Recovery routes can also be based on legal obligations such as binding recovery targets. The recovery targets are mostly based on the volume of the whole waste streams and a certain percentage of recovered fractions of this waste stream in weight. Rare earth elements are used in very small quantities and therefore their recovery does not make a huge difference in terms of fulfilling the binding quotas set in the recovery and recycling targets. Copper scrap, on the other hand, is used in bigger quantities and can therefore have a greater impact on the fulfilment of the objectives of the recovery targets. EoW copper scrap can also be counted in the recovery targets.

It seems that the concept of waste is not the main impediment to more efficient waste management and closure of the loop. The legislation on waste status, the way in which the concept is interpreted, and the exemptions from it are extremely important and play a big part in incentivising the use of secondary materials as substitutes for virgin raw materials. However, they only indirectly create incentives to prefer recovery over disposal. As important as it is to develop the legal framework and draw a clearer distinction between waste and non-waste in material circulation, it is as important to provide incentives and legal obligations for more comprehensive collection and separation schemes.

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703 See ‘Towards a Circular Economy: Business Rationale for an Accelerated Transition’, Ellen MacArthur Foundation 2015, p. 16, for the point that functioning reverse logistics are crucial to the re-use of waste in production processes. The reverse logistics applicable to waste include a great deal more than the mere transportation of material, and also include its sorting and treatment. See also ‘Towards the Circular Economy Vol. 2: opportunities for the consumer goods sector’, Ellen MacArthur Foundation 2013, p. 83, for the point that organising these reverse logistics could be a huge opportunity for economic growth for waste management companies.

704 Using copper also has a longer history and rare earths have only been used actively for few decades.
5 ENERGY RECOVERY FROM MUNICIPAL SOLID WASTE

5.1 INTRODUCTION

5.1.1 Features and collection of municipal solid waste (MSW)

Although the circular economy mostly pursues the more efficient material recovery from wastes, the recovery of energy also plays a part in waste management in the EU. In the strict sense, waste-to-energy (WtE) operations do not promote the circularity of economy since the point of circularity is to prolong products’ life-cycles and give materials a new life-cycle after end-of-life treatment. However, they support the main priorities of the waste hierarchy and form part of the drive towards the cascading use\textsuperscript{705} of unrecyclable waste streams. After WtE the life-cycle of the waste is technically over: it is burned and reduced to ashes and energy. Therefore, the position of WtE in relation to the circular economy is debatable. However, realistically, waste streams that cannot be recovered as materials in an economically feasible way are widely used for energy production.

Using waste-based fuels in energy production reduces the need for imported fuels and increases the self-sufficiency of energy production at national level. In addition, burning waste uses waste that is inadmissible to material recovery while fulfilling the objectives of the waste hierarchy.\textsuperscript{706} For this reason, WtE operations are particularly beneficial in Member States whose recycling markets are still developing, landfill is at maximum capacity, and which are extremely dependent on foreign energy.\textsuperscript{707} In addition, WtE operations can be extremely beneficial in Member States where the demand for heat energy is high.\textsuperscript{708} In the circular economy, when waste cannot be prevented or recovered as a material, recovering its energy content is preferable to landfilling in terms of environmental and economic impacts. Thus WtE has potential to play a big role in the circular economy.\textsuperscript{709} The waste hierarchy indicates that measures taken in respect of WtE or waste management should lead to a situation where

\textsuperscript{705}Cascading use refers to an efficient use of resources from the point of view of natural resource as well as material and land consumption. The concept of cascading use partly overlaps with the waste hierarchy and the circular economy. Like the circular economy the concept of cascading use extends beyond waste legislation and policy objectives.

\textsuperscript{706}See European Commission: Roadmap to ‘Exploiting the potential of waste to energy under the energy union framework strategy and the circular economy’. European Commission 2016, p. 3, for the point that different interpretations of the waste hierarchy have made the use of waste in energy production problematic.


\textsuperscript{708}If the electrical efficiency of WtE operations could be increased by using modern technology, they could be an important source of energy in any country.

more efficient material recovery operations have to compete with WtE producers for available waste materials. This has to be taken into consideration if measures promoting WtE are contemplated.

This chapter focuses on using municipal solid waste (MSW) in energy production because it is the most popular waste stream for energy recovery. MSW refers to a waste stream that consists of household waste items discarded by the public. It is considered one of the most difficult waste streams to manage due to its mixed composition, the direct proximity of the generated waste to people, and very high public visibility. The greatest problem with using MSW in recovery operations is the fact that its composition varies greatly depending on the geographical area and changes significantly over time. Therefore, it is impossible to comprehensively define its exact characteristics and consistency on a wide scale. Because MSW fits poorly with other recovery operations, it is a cheap waste stream to use in energy production. It also has a large generation volume, which is essential for WtE production.

The Article 3(2b) of the amended WFD defines municipal waste as follows: (a) mixed waste and separately collected waste from households, including paper and cardboard, glass, metals, plastics, bio-waste, wood, textiles, packaging, waste electrical and electronic equipment, waste batteries and accumulators, and bulky waste, including mattresses and furniture, (b) mixed waste and separately collected waste from other sources, where such waste is similar in nature and composition to waste from households. According to the Article municipal waste does not include waste from production, agriculture, forestry, fishing, septic tanks and sewage network and treatment, including sewage sludge, end-of-life vehicles or construction and demolition waste. The definition is without prejudice to the allocation of responsibilities for waste management between public and private actors. Even after the amendment, MSW comprises thoroughly heterogeneous waste streams.

Nevertheless, MSW is rarely incinerated as such but is often processed into refuse-derived fuel (RDF) or solid recovered fuel/specified recovered fuel (SRF) materials. RDF and SRF are produced by shredding and dehydrating MSW so that energy can be produced more efficiently. The shredding of the MSW is essential so that WtE plants can utilise the material without risk of blockages being caused by bigger pieces of MSW. Dehydration is carried out in order to make the incineration process more efficient. The difference between RDF and SRF is that SRF materials need to meet...
higher standards than RDF materials. Standards for SRF are set in standard EN 15359 by the CEN/TC 343 technological committee. Since regular RDF does not follow these standards, the consistency and features of RDF are less predictable and RDF is mostly used as a general term to describe MSW that has been processed for efficient WtE operation. This difference is made clear in the following figure.

Figure 6. Principle for distinguishing SRF from refuse-derived fuel (ERFO).

The heterogeneity of MSW-based fuels has an essential effect on its waste status and potential use. Therefore, it is crucial to scrutinise WtE fuel sales contracts carefully as they often function as a kind of a quality assurance of the waste-based fuel product. WtE operations often use waste streams that are big in volume like MSW since they need a constant supply of material in order to ensure continuous energy production. In essence, the operator concludes contracts to buy MSW, RDF or SRF from either a private or a public party. Contracts with public parties are usually long-term contracts

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715 BREF 2006, pp. 222–223. The identifiability provided by the standards assists in the recovery of materials.

716 Standard provided by the European Committee for Standardization.


of an approximate duration of 25 to 30 years. Under these contracts the public party provides the operator with a sufficient amount of the material in return for payment and acceptance of the agreed amount of MSW. The contracts are often beneficial for both parties. Another way for the operators to obtain the necessary input is through merchant projects, in which the operator contracts with multiple private actors to fulfil its need for material input. These contracts are usually shorter than the public contracts, being usually of duration of around 10 years or less. Otherwise the basic content of the contracts is similar. Some operators utilise hybrid versions of contracts and buy MSW from both the public sector and from private parties.

The parties can agree on certain standards, or whether the operator wants to buy MSW, RDF or SRF. In many cases the operator prepares the RDF and SRF itself and only buys MSW pursuant to the contracts. If the operator wants to control the stream of material supplied, this can be done more easily using merchant contracts since where public contracts are utilised the public sector cannot predetermine or control its waste streams. As for private contracts, the suppliers often have adequate knowledge of the characteristics of their typical waste streams. The quality of the waste directly affects the plant’s emissions and energy efficiency.

5.1.2 Position in the waste hierarchy

The waste hierarchy provides that WtE operations are justified in three scenarios: (1) where otherwise the waste will be subject to a disposal operation and therefore other recovery operations, such as energy production, offer the best alternative in the waste hierarchy; (2) where energy production offers the environmentally best option pursuant to a life-cycle assessment and therefore bypasses the option of material recovery while respecting Article 4(2) WFD; and (3) where the waste is disposed by means of incineration with no or very little energy production. The last scenario is considered a disposal operation and is automatically placed on the last step of the hierarchy as the least favourable option. Producing energy from waste can, however, be considered part of a recycling operation when it is executed in anaerobic digestion of organic waste and the digestate is recycled as a fertiliser. In those conditions it is a part of a recycling operation where the production of fertiliser is a primary aim.

Scenario (1) is probably the most common and widely agreed upon. It is rather typical for an MSW, where it is not economically viable to recover the waste as a material due to the costs involved in sorting the waste. However, these waste streams are well

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722 Turunen & Van Calster 2016, p. 4.

723 COM (2017) 34 final, p. 4.

724 See Sahimaa 2017, pp. 40–41: Approximately 70 % to 80 % of the MSW could be recovered as materials.
integrated into the energy production. Scenario (2) is more unusual. Theoretically it requires proof that material recovery from the waste material is the worse option environmentally compared to energy recovery, considering the product’s life-cycle. For this to be the case, the material recovery operations followed in respect of the product should have clear adverse environmental impacts, because if the waste is used in energy production, its life-cycle ends. The existence of national regulation concerning the departure from the hierarchy regarding energy production can make it more acceptable to promote WtE installations instead of ‘better’ recovery measures since the position of EoW would be backed up with extensive life-cycle analysis.

The European Parliament has been sceptical about the other recovery status of co-incineration plants using waste-based fuels. For co-incineration and other WtE operations to be considered a recovery operation instead of disposal operation they must uphold certain energy efficiency standards. If these standards are not met, the operation is considered a disposal operation. Drawing a line between efficient and inefficient energy production is a crucial point in assessing a material’s recovery status and is discussed in the next chapter.

5.2 WTE AS A RECOVERY OPERATION

5.2.1 Drawing a line between recovery and disposal operations

In the EU WtE is more than a way of disposing of waste inadmissible to material recovery. In recent years the production of energy from waste has increased due to the entry into force of the WFD and there have also been increases both in the amount of waste produced and in demand for energy. Heat and electricity are produced from waste and waste-based fuel products. WtE production has proven highly efficient even though producing electricity from waste is somewhat complicated. Even when heat and electricity are often produced in the same operation, heat production has

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726 This could be the case if the waste material consists of substances of very high concern (SVHC) under REACH.

727 Turunen & Van Calster 2016, p. 4. Article 4(2) of the WFD requires a life-cycle based assessment for departures from the basic priority order.

728 See Van Calster 2015a, p. 64.


730 Combined heat and power (CHP) operations. See European Commission: Roadmap to ‘Exploiting the potential of waste to energy under the energy union framework strategy and the circular economy’. European Commission 2016, p. 2. A great part of the efficiency of the WtE installations comes from heat recovery.
been more efficient in these operations.\textsuperscript{731} Using WtE production reduces the need for imported fuels and increases the level of self-sufficiency in energy production at national level. Because of this, WtE is also a part of the EU’s Energy Union strategy.\textsuperscript{732} In addition, burning waste destroys the waste that is inadmissible for material recovery while fulfilling the objectives of the waste hierarchy.

Positioning WtE operations in the waste hierarchy as recovery operations or disposal operations has a decisive effect on the legislative framework governing the installations and their practical functioning.\textsuperscript{733} In addition, recovery operation status impacts the shipment of waste since only wastes destined for recovery may be shipped as green list wastes. It is also the precondition for ceasing to be waste.\textsuperscript{734} Recovery operation status also extends the permissible period for temporary storage from one year to three years, which enables, for example, the waste-based fuel to be used at times of high demand for heat energy. In theory it could also increase the public acceptance of WtE: investments, loans and acceptance from an environmentally conscious public are more likely to be forthcoming for recovery operations than for burning waste for disposal.

The main difference between recovery and disposal operations is that in recovery operations the waste serves a useful purpose and fulfils a beneficial function while in disposal operations the waste serves no useful purpose either in a plant or in the wider economy. In differentiating between the two categories for WtE operations, the efficiency of the installation is decisive: since waste produces energy in an incineration process, it is only a matter of efficiency as to whether it produces enough energy to be considered a beneficial function in a plant or in the wider economy. In recovery operations, the waste produces enough energy to be considered a substitute for virgin fuel products, while in disposal operations some energy is produced from the waste but the main objective of the operation is waste disposal.\textsuperscript{735}

The CJEU has heard a vast number of cases on the classification of WtE operations as recovery or disposal operations. One principle developed at an early stage by the CJEU was that in recovery operations waste has to replace raw materials and help to conserve natural resources.\textsuperscript{736} In Commission v Germany\textsuperscript{737} the CJEU held that incineration should be considered a recovery operation when it fulfilled the following criteria set out in paragraph R1 to Annex II to Directive 75/442/EEC\textsuperscript{738} (which was


\textsuperscript{733} See e.g. Van Calster 2015b, p. 365.


\textsuperscript{735} The operations can also be considered disposal if the produced energy is not utilised: combustion waste always produces heat energy but if it is not utilised, for example, in district heating, it cannot be calculated towards the efficiency threshold.


\textsuperscript{737} C-228/00 Commission v Germany (2003) ECR I-1439.

the directive on waste then in force): (1) the amount of energy produced must be larger than the amount of energy consumed in the operation; (2) the surplus energy produced should be used in producing heat or electricity; and (3) the waste should be mainly used as a fuel or other means of producing energy. In Commission v Netherlands the amount of produced energy and its feasibility was considered in relation to a WtE operation. A great deal of subsequent case-law has also referred to the R1 efficiency standards or R1 formula contained in Annex II to the WFD.

A WtE operation is either a R1 operation where the waste is used principally as a fuel or other means to generate energy and is considered a recovery operation, or a D10 operation where the waste is incinerated on land and is a disposal operation. The D10 operation is listed together with other examples of disposal operations in Annex I to the WFD. The main distinction between R1 and D10 is that if the D10 operation produces energy at all, the production should be so inefficient that it cannot be considered the main function of the operation. The main function of D10 is waste disposal. WtE installations that can produce energy in efficiently are to be considered R1 recovery operations. Pursuant to the CJEU’s case-law on the recovery classification of WtE operations using MSW it would seem clear that in order to attain recovery operation (other recovery operations) status the operation must fulfil the requirements of the R1 formula. The present R1 formula can be found in the footnote to paragraph 1 of Annex II to the WFD.

5.2.2 R1 efficiency formula

Paragraph R1 of Annex II to the WFD provides that when waste is used principally as a fuel or other means to generate energy, the operation shall be considered a recovery operation. However, this definition still leaves an interpretative gap in respect of whether the operation is a recovery operation or a disposal operation. It is often debatable whether the waste is used principally as a fuel or other means to generate energy. In this regard, an installation that generates energy from waste can still be considered a disposal operation despite the energy produced if the purpose of the incineration is waste disposal rather than energy production. For this reason, the footnote to R1 contains a clear efficiency formula for WtE operations utilising municipal solid waste.

The efficiency criteria laid down in Commission v Germany together with the R1 standard constitute the main rules governing the assessment of whether an operation is considered a recovery or a disposal operation. The original R1 standard did not include any actual efficiency rates or strict standards on which to assess whether a particular WtE operation was principally producing energy. Therefore, it did not significantly increase legal certainty as it left it quite unclear as to what threshold

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739 See Evers 2015b, p. 135. See also Guidelines on the interpretation of the R1 energy efficiency formula for incineration facilities dedicated to the processing of municipal solid waste according to Annex II of the WFD, European Commission 2011.


had to be reached to fulfil the three criteria set in Commission v Germany\textsuperscript{742} to qualify as an R1 operation. The original R1 standard simply stated that the waste should be used principally as a fuel or other means to generate energy, to which the CJEU added the above-mentioned interpretative criteria. Before the WFD entered into force, neither the size of the installation nor the climate of the Member State concerned was considered.\textsuperscript{743} In the present R1 formula these factors are taken into account and the formula is based more firmly on electricity efficiency.\textsuperscript{744} The original R1 did not lay down specific values for the energy production efficiency required in order to achieve recovery operations status where the waste is principally used as a fuel or other means to generate energy. The current version of the R1 sets an EU-wide standard applicable to all WtE installation using municipal solid waste as a fuel.\textsuperscript{745} The footnote to the paragraph on R1 in Annex II to the WFD regulates the conditions under which waste can principally be used as a fuel or other means to generate energy in the following way:

‘This includes incineration facilities dedicated to the processing of municipal solid waste only where their energy efficiency is equal to or above:
- 0,60 for installations in operation and permitted in accordance with applicable Community legislation before 1 January 2009,
- 0,65 for installations permitted after 31 December 2008, using the following formula: Energy efficiency = (Ep – (Ef + Ei))/(0,97 × (Ew + Ef))

In which:
Ep means annual energy produced as heat or electricity. It is calculated with energy in the form of electricity being multiplied by 2,6 and heat produced for commercial use multiplied by 1,1 (GJ/year)
Ef means annual energy input to the system from fuels contributing to the production of steam (GJ/year)
Ew means annual energy contained in the treated waste calculated using the net calorific value of the waste (GJ/year)
Ei mean annual energy imported excluding Ew and Ef (GJ/year) 0,97 is a factor accounting for energy losses due to bottom ash and radiation.
This formula shall be applied in accordance with the reference document on Best Available Techniques for waste incineration.’

According to the R1 formula, WtE facilities burning MSW are considered recovery operations if their energy efficiency figure is 0.65. If the installation is in operation and functions under the conditions of a permit issued before 1 January 2009, the

\textsuperscript{742} C-228/00 Commission v Germany (2003) ECR I-1439.


\textsuperscript{744} Non-paper on the background of the development of the Commission proposal on the distinction between energy recovery and disposal of waste in municipal incinerators, pp. 2–3.

\textsuperscript{745} See Scotford 2009, p. 85, for the point that the R1 formula provides some insight into what is to be considered a recovery operation in relation to WtE production. However, there is room for legal argument as to the determination of when an operation is relevantly geared towards ‘serving a useful purpose’. In this regard, I use the term ‘appropriate level of interchangeability’ to describe when operations fulfil the legal definition set out in Article 3(15).
threshold is a little bit lower, at 0.60. The amount of electricity produced in the WtE installation is multiplied by 2.6. The amount of heat energy produced is in turn multiplied by 1.1 in calculating the efficiency, giving electrical efficiency over twice as much importance in calculating efficiency despite the fact that most of the energy produced in WtE operations is heat energy. Modern WtE facilities can only achieve around 28% electricity efficiency, which means that 72% of the calorific value in waste emerges as heat energy and not electricity. Modern WtE technology is easily efficient enough to meet the efficiency targets set in R1 in Member States that have a high demand for heat. Nonetheless, inefficient WtE installations that are unable to achieve the standards are therefore considered to be disposal operations, especially in Member States that have a low recovery rate for heat energy because of their warm climates and undeveloped district heating networks.

If a WtE operation fulfils the efficiency formula set out above, the operation is considered a recovery operation. Waste streams other than municipal solid waste can demonstrate the recovery operation status of the installation in another way while complying with the definition of recovery operations set out in Article 3(15) of the WFD. It must be borne in mind that the recovery operation list contained in Annex II to the WFD is non-exhaustive and the R1 formula for energy production efficiency only applies directly to municipal solid waste. The formula is designed to assess the efficiency of burning municipal solid wastes because they are the most commonly used fuels in WtE production due to their availability and heterogeneity. Other more homogeneous waste streams tend to be used in material recovery operations under the waste hierarchy in order to prolong their life-cycles.

It does not suffice, in order to achieve recovery operation status, for the waste merely to replace virgin fuel products. It also has to achieve a certain rate of interchangeability to function as a substitute for the virgin fuel products, which in practice means that the use of waste-based materials should substantially reduce the need for virgin raw materials. For MSW, the R1 threshold has been laid down as being the appropriate

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747 See Ozansoy, Cagil, ‘Development of revised R1 thermal energy efficiency guidelines for energy from waste plants’, International Journal of Energy Research 40 (9) 2016, pp. 1183–1184: Up to 86.1% of the large capacity WtE plants fulfill the requirements of R1 for existing plants. In addition a large proportion of WtE facilities can even achieve the higher standard of 0.65 set for new facilities.

748 The district heating networks and their development and construction are complicated subjects of regulation due to the many parties involved and the local character of the networks. See de Deyne, Laura, ‘Legal Framework on District Heating Networks in Belgium and the Netherlands: Competition, Unbundling and Reasonable Prices?’, EEELR 25 (1) 2016, pp. 11–24.

749 Whereas there is a clear textual framework for the interpretation of ‘recovery’ in case of municipal solid waste, the interpretation is extended to systematic and teleological approach in case of other waste streams although the R1 formula should be taken into account in the evaluation of the ‘usefulness’ of the substance or object.

750 See BREF 2006, pp. vi. See also, for example, Van Calster 2014a, p. 528.

751 This precondition is laid down in the criteria for by-product and end-of-waste statuses in Articles 5 and 6 of the WFD.
level of interchangeability to consider the waste as a substitute for fuel products, and can be used as an example for energy efficiency standards for other waste streams.\textsuperscript{752}

In \textit{Commission v Germany}\textsuperscript{753} the CJEU ruled that in the absence of EU-wide criteria on the issue of whether certain operations are to be considered recovery or disposal operations, these could be set at national level on the basis that such criteria do not conflict with the definition of ‘recovery’ laid down in the WFD. The R1 standard represents EU-wide criteria applicable in all Member States: WtE installations using municipal solid waste in the EU must comply with the R1 formula, because they are considered to be disposal operations if they do not. For other waste streams, separate provisions on the specific energy production efficiency values required can be laid down. However, it may prove complicated to justify significantly different calculations for the appropriate level of interchangeability. The appropriate level of interchangeability is naturally tied to some extent to the calorific value of MSW based fuels. Nonetheless, the rules for the calculation are based on the details of the virgin fuels that are being substituted with waste-based fuels so that the formulation of the concept of recovery laid down in Article 3(15) of the WFD meets the R1 threshold.

5.2.3 Climate correction factor

It is hard for Member States with low heat demand to achieve recovery status through the R1 formula in view of the fairly poor electricity production efficiency of current WtE technology. This means that many Southern European WtE installations amount to waste disposal operations. On the one hand, this makes a lot of sense because since the Southern WtE facilities produce only a certain amount of beneficial energy, they would not be efficient enough to fulfil the required level of interchangeability between the waste and virgin material necessary to be considered recovery operations under Article 3(15) of the WFD. On the other hand, it seems unsatisfactory to leave semi-efficient WtE installations at the same level in the waste hierarchy as incineration with no energy recovery.\textsuperscript{754}

Under the R1 formula an installation that is highly beneficial in a colder climate can be considered a disposal operation in a warmer climate because the heat energy cannot be utilised and calculated towards an efficiency standard due to the lack of an adequate district heating network in which the heat energy produced could be utilised. Unsurprisingly, extensive district heating networks are located in Member States and areas in which there is a high demand for heat and not in those in which the heat produced is not utilised because the local climate is warm. In these countries there is little incentive to move from landfilling or burning waste, which involves absolutely no energy production, to the setting up of efficient WtE facilities that harness the

\textsuperscript{752} The level of interchangeability required for other waste streams should be similar to the R1 standard, but should also take into account the material recovery potential of the waste if it was not used in energy production. In this way the threshold can be connected with the value chain and life-cycle of the material.

\textsuperscript{753} C-228/00 Commission v Germany (2003) ECR I-1439.

\textsuperscript{754} See Helsen & Agon & Bosmans 2018, p. 43, for the point that nowadays, waste incineration is almost always combined with energy recovery.
energy potential of the waste streams. These matters have been taken into account in the current WtE legislation.

Article 38 of the WFD states that the Commission may develop guidelines for the interpretation of the definitions of recovery and disposal. As the only strict standard for recovery operation status in the WFD, this article stipulates that ‘[i]f necessary, the application of the formula for incineration facilities referred to in Annex II, R1, shall be specified’. Local climatic conditions, such as severe cold, and the need for heating may be taken into account insofar as these issues influence the amounts of energy that can technically be used or produced in the form of electricity, heating, cooling or processing steam. These amendments must be made in the light of scientific and technical progress. Thus the WFD creates a system under which amendments to the R1 efficiency formula may be made on the basis of climatic conditions and local conditions in outlying regions such as Guadeloupe, French Guiana and Martinique,

The main problem with the R1 standard is the fact that installations in warmer climates cannot utilise the produced heat energy in district heating infrastructures and therefore the efficiency standard cannot be met solely on the strength of the relatively poor electricity production levels of modern WtE technologies. Even though the importance of electricity production is emphasised in the R1 standard, where there is a low demand for heat it is unlikely that the level of energy production efficiency laid down in the R1 standard will be achieved. The Annex to Directive 2015/1127/EU contains a multiplication formula designed to take the above-mentioned problems into account. This is as follows:

‘The energy efficiency formula value will be multiplied by a climate correction factor (CCF) as shown below:

1. CCF for installations in operation and permitted in accordance with applicable Union legislation before 1 September 2015.
   \[
   \begin{align*}
   \text{CCF} &= 1 \text{ if } \text{HDD} \geq 3 \, 350 \\
   \text{CCF} &= 1,25 \text{ if } \text{HDD} < 2 \, 150 \\
   \text{CCF} &= - (0,25/1 \, 200) \times \text{HDD} + 1,698 \text{ when } 2 \, 150 < \text{HDD} < 3 \, 350
   \end{align*}
   \]

2. CCF for installations permitted after 31 August 2015 and for installations under 1 after 31 December 2029:
   \[
   \begin{align*}
   \text{CCF} &= 1 \text{ if } \text{HDD} \geq 3 \, 350 \\
   \text{CCF} &= 1,12 \text{ if } \text{HDD} < 2 \, 150 \\
   \text{CCF} &= - (0,12/1 \, 200) \times \text{HDD} + 1,335 \text{ when } 2 \, 150 < \text{HDD} < 3 \, 350
   \end{align*}
   \]

(The resulting value of CCF will be rounded at three decimal places).

The value of HDD (Heating Degree Days) should be taken as the average of annual HDD values for the incineration facility location, calculated for a period of 20 consecutive years before the year for which CCF is calculated. For the calculation of the value of HDD the following method established by Eurostat should be applied: HDD is equal to \((18 \, ^\circ C - Tm) \times d\) if \(Tm\) is lower than or equal to \(15 \, ^\circ C\) (heating

755 The efficiency factor is the basic difference between the R1 standard set out in Annex II to the WFD and the D10 disposal operation ‘Inincineration on land’. Drawing a line between these two should, in my opinion, be based on the level of substitution and interchangeability between a waste product and a virginal product.

threshold) and is nil if $T_m$ is greater than 15 °C; where $T_m$ is the mean ($T_{\text{min}} + T_{\text{max}}/2$) outdoor temperature over a period of $d$ days. Calculations are to be executed on a daily basis ($d = 1$), added up to a year.

The Annex lays down the rules on the climate correction factor (CCF), which multiplies the energy efficiency figure from the R1 formula. The CCF number depends on the climate of the area – or, more accurately, on the ‘heating degree days’ within the area during the last 20 years. If the Member State or area has a high number (more than 3350 during the last 20 years) of heating degree days, its CCF is one and its energy efficiency figure will be multiplied by one (i.e. it stays the same). The Member States or areas in this category are those that have a high demand for heat energy, which can achieve the R1 efficiency threshold with ease because they usually have adequate district heating grids to utilise the heat energy produced. In areas with a lower number of heating degree days the CCF increases up to 1.25 or 1.12 depending on the operating and permitting date. Older WtE installations can obtain the highest CCF of 1.25. In practice this means that their energy efficiency figure will be a quarter bigger than before.

The higher the CCF, the higher the energy efficiency and the greater the likelihood that the installation will achieve the energy efficiency objectives of 0.60 or 0.65 required for recovery operation status under the R1 standard set out in the WFD. Hence the CCF lowers the energy efficiency threshold, for Member States that have a warmer climate, for the achievement of the R1 standard in their WtE installations, thus making them recovery operations. It also guides MSW away from disposal operations to energy production even when the margin of benefit is not as big as in Member States that have a high demand for heat. Therefore, lowering the R1 threshold and in this way steering MSW towards WtE production instead of disposal is a means of seeking to achieve the objectives of the waste hierarchy in situations where the waste is inadmissible to material recovery. The CCF does not impact WtE facilities that already act as recovery operations according to the R1 standard as the energy efficiency figure is only essential in the sense of achieving the recovery status. The CCF’s can allow semi-efficient D10 WtE plants to be classified R1 plants in warmer climates. As a result of this, a distinction is created between incineration involving no energy recovery and incineration involving some energy recovery.

It can be argued that the heat energy produced could be transformed into cooling energy to be used in cooling networks in warmer areas. However, the demand for cooling is often much shorter in duration (around three months per year) than the need for heating (six to eight months per year). Therefore, the incentives for the

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757 Eurostat has been monitoring the annual heating degree days and the demand for heat of Member States and their regions. The results can be found at http://ec.europa.eu/eurostat/web/energy/data/database. The differences between Member States are substantial. The basic rule, however, is that the Northern European Member States have more heating degree days than Southern European Member States. See Report on the impact of R1 climate correction factor on the Waste-to-Energy (WtE) plants based on data provided by Member States, JRC Scientific and Policy Reports. European Commission 2014, p. 4, for the point that European WtE installations are located in areas where the number of heating degree days is between 612 and 5209.

758 See Energy Recovery Efficiency in Municipal Solid Waste-to-Energy plants in relation to local climate conditions, Study conducted by Clerens Consulting with the collaboration of ESWET, Brussels 2012, pp. 82–83, for the point that the proposed maximum CCF of 1.382 was substantially higher than that laid down in the Commission Directive (1.25).
building of extensive cooling networks are economically much smaller than for the building of district heating grids. Because of this, the number of cooling networks has remained low even in warmer areas. On this basis the Commission decided that harnessing the cooling energy potential of WtE facilities could be ignored in drafting the CCF scheme.\footnote{Report on the impact of R1 climate correction factor on the Waste-to-Energy (WtE) plants based on data provided by Member States, JRC Scientific and Policy Reports. European Commission 2014, pp. 8–9.}

The objective of the CCF scheme is to create coherence between the strict R1 formula and the vague objectives of the waste hierarchy by creating a clearer distinction between recovery and disposal operations. Nevertheless, the CCF should not aim to entirely offset the handicap suffered by plants generating electricity against those exporting heat because R1 should remain an incentive to increase the use of recovered heat. The CCF should only function as a counterbalancing mechanism in situations where the heat demand does not justify the construction of significant district heating networks, thus making it impossible to recover the produced heat energy. The limit for this is set at 2150 heating degree days for Member States and areas. National differences in terms of the ability to recover heat energy have a greater impact on the efficiency of WtE operations in different Member States than differences in electricity production, even given that electricity production efficiency is lower in Member States that have warmer climates.\footnote{Energy Recovery Efficiency in Municipal Solid Waste-to-Energy plants in relation to local climate conditions, Study conducted by Clerens Consulting with the collaboration of ESWET, Brussels 2012, pp. 9, 22, 51–82.}

The Commission emphasised the importance of efficiency and use of combined heat and power production in its communication on WtE and the circular economy. For Member States with no need for district heating grids or heat, it makes no sense to make long-term investments in waste recovery technologies that the Commission is planning to phase out in order to promote higher-ranking processes in the waste hierarchy.\footnote{See COM (2017) 34 final, pp. 7–8.} The classification of WtE operation as recovery or disposal operation is illustrated in the following figure.
5.3 MUNICIPAL SOLID WASTE AND WASTE STATUS

5.3.1 Introduction

In EU waste legislation all objects and substances are either waste or non-waste and all waste treatment operations are considered to be either recovery or disposal operations.\textsuperscript{762} The waste status of the fuel has a significant effect on the applicable regulatory framework. If the fuel is classified as waste, the plant in which it is incinerated is classified as a waste incineration plant regulated under Chapter IV of the IED. The IED lays down special provisions for the burning of the waste, such as a requirement for the incineration to occur at predetermined high temperatures. This requirement may have conclusive impacts in respect of the practicalities of the WtE installation and make it less appealing in a technical and commercial sense, especially in periods of lower heat and less demand for power (such as during the summer).\textsuperscript{763} In addition, this requires expensive investments, for example a system for the purification of the combustion gases. WtE operations would significantly benefit if they were able to bypass these requirements by burning fuel products that are not classified as waste.

Wastes recovered in energy production can be classified as by-products if they are production residues or cease to be waste under Article 6 of the WFD, as is the case


for wastes that are recovered as materials. Concepts like RDF and SRF may mislead the operator into thinking that the materials are not considered waste. However, this point of view has not prevailed in any of the cases heard by the CJEU.764 For example, the national standards set in the UK for WtE fuels are more stringent than those set out for SRF in the EN standard.765 Assessment of waste status needs to be rooted in the interpretation of waste legislation instead of being based on operational concepts such as RDF or SRF.766

5.3.2 Waste status and waste-based producer gas

Sometimes the wastes are gasified and burned as waste-based producer gases. This is usually a more efficient way of using waste in energy production than burning solid or liquid waste as such.767 In general the main difference between producer gas and natural gas is that producer gas is manufactured from another product and natural gas is gathered from natural sources. Both require pre-processing before they can be utilised as fuel products. Producer gas can be manufactured from all kinds of materials such as wood, coal and coke or other carbonaceous material, but can also be manufactured from waste-based substances. References in this dissertation to producer gas should be understood as references to producer gas manufactured from waste-based substances like MSW, RDF or SRF. The emissions produced by burning producer gas are different from those produced by burning natural gas: for example, unlike burning natural gas, burning producer gas may produce heavy metal emissions due to the chemical composition of the waste substances involved.768 Producer gas can be produced in many different ways. For example, thermal treatment is one of the most common ways of producing it.

Article 42 of the IED provides that the Directive applies to incineration plants and co-incineration plants burning solid or liquid waste. However, the IED’s provisions on incineration do not apply to gasification or pyrolysis plants if the gases resulting from this thermal treatment of waste are purified to such an extent that they are no longer waste prior to their incineration and they can cause emissions no higher than those resulting from the burning of natural gas. The wording of Article 42 stems from the CJEU’s ruling in Lahti Energia.769 What is problematic in the wording of Article 42 of the IED, which resulted from the decisions in the first Lahti Energia case,770 is that in order for burning producer gas not to be classified as incinerating waste it has to achieve

765 EN standard refers to European Standard that are documents that have been ratified by one of the three European Standardization Organizations. See R (on the application of OSS Group Ltd) v Environmental Agency (2007) EWCA Civ 611.
766 Evers 2015b, pp. 133–134.
767 See COM (2017) 34 final, p. 8. The Commission’s communication considers the use of pure MSW in WtE operations to be a bad practice that should be phased out in the sector.
768 See Nasrullah 2015, p. 5–6.
769 C-317/07 Lahti Energia (2008) ECR I-09051. See Gillespie 2015, pp. 8–10, 60. At international level, waste is often classified as an unwanted solid substance that has no further use. Gases are often classified not as waste but as emissions in international law.
the same emission standards as burning natural gas. This is where the issue becomes complicated: since burning natural gases does not cause any heavy metal emissions, these emissions are not covered in the legislation applicable to natural gases.\textsuperscript{771}

This lack of a regulatory framework on heavy metal emissions can be interpreted in two ways: (1) no limits are set for heavy metal emissions and they can theoretically be anything; or (2) there is an absolute prohibition of heavy metal emissions. Although it represents a formalistic approach to unregulated territory, the first scenario is clearly an irresponsible choice that does not accord with the requirement for a high level of protection of the environment and of human health. However, the second interpretation could mean that no gases that produce any heavy metal emissions could ever be burned lawfully as non-waste. Since most waste-based producer gases contain small amounts of heavy metals due to the features of the solid or liquid wastes from which they are produced, this interpretation would lead to a situation where solid materials could circumvent the IED’s provisions on the combustion of waste while more efficient gasification of the same waste streams would fall under the stricter regulatory scheme.\textsuperscript{772}

Following the initial implementation of the IED in Finnish law, an amendment was made to the national law that introduced a different formulation of this provision. While the IED itself requires the comparison between waste and non-waste gases to be made in respect of natural gases, section 1 of the Finnish Decree on burning waste\textsuperscript{773} provides that the burning of the gas shall be compared to natural gases or other gaseous fuels that are commonly in use. This formulation gives facilities that burn producer gas some leeway in interpreting the application of the provisions on waste incineration to gases. Enabling the use of gasification processes helps promote the use of more efficient WtE processes.

In the \textit{Lahti Energia} cases\textsuperscript{774} it was also decided that the incineration status was ultimately the result of the thermal treatment carried out in the production stage of the gas because this thermal treatment was held to be an integral part of the power-generation complex.\textsuperscript{775} However, this issue is addressed in a different manner in Article 42(1) of the IED and the burning of the waste is not considered incineration purely on the basis of the production method used in respect of the producer gas. However, if the MSW, RDF or SRF in the gasification process is considered to be waste, the gasification process is considered to be incineration, no matter what emissions are created from the final producer gas and regardless of its quality.

\textsuperscript{773} Valtioneuvoston asetus jätteiden polttamisesta (In English, Government Decree on Waste Incineration, 151/2013, amended in (1303/2015)).
5.3.3 WtE and by-product status

Article 5 of the WFD covers the by-product status of a substance or object. Production residues that have a certain further use in energy production can be classified as by-products instead of waste in the same way as any materials destined for material recovery if they fulfil the criteria set out in Article 5 of the WFD. WtE installations usually fulfil the first two of the criteria. Since the WtE installations require and use a large volume of material, further use of the fuel products is usually certain. Moreover, waste-based fuel products usually do not require more than ‘normal industrial practice since they are usually just shredded and dehydrated prior to their use. In addition, cleaning and homogenisation are also usually considered normal industrial practices. Burning the waste usually does not require the waste to have many special features except a high calorific value.

In order to achieve by-product status, the production residue should also comply with the applicable legislation and its use should not cause adverse environmental or human health impacts. The environmental impacts of WtE processes are assessed at an early stage in the process. Given an adequate level of quality control and monitoring of the emissions, burning waste streams that resemble virgin fuel products to a sufficient extent should be capable of fulfilling the fourth by-product criterion set out in Article 5 of the WFD.

It would seem that there are no explicit barriers preventing waste-based fuel product from being classified as a by-product. Nevertheless, most MSW is consumer waste and, as such, is not production residue because it has already been discarded and classified as waste. By-product status applies only to residues from production and not from households and consumers. Even when it is clear that MSW or MSW-based fuel products cannot be considered by-products, it is possible for certain residual fuel products to be classified as by-products. This problem has been under the microscope in relation to burning horse-manure-based briquettes and other products manufactured from agricultural waste streams. By-product status may apply to the ashes or other residues from the WtE facility.

5.3.4 MSW and the end-of-waste status

EoW status is available for materials that are classified as waste. However, pursuant to Article 3(1) of the WFD, by-product status is only available for production residues before they are discarded and become waste. The EoW criteria laid down in Article 6 of the WFD apply in respect of all substances and objects that are considered waste.

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776 See e.g. Rogoff & Screve 2011, p. 34.
778 Evers 2015b, p. 129.
779 See Mattravers 2015, pp. 40–42, for the point that the profitability of the WtE operation is naturally connected with the possible markets for by-products of incineration. See also Massai, Leonardo, ‘EU Case-Law and Waste Management in Campania’, in Panoussis, Ioannis K. & Post, Harry H. G. (eds.), Waste Management in European Law: The Example of Naples and Campania, Eleven International Publishing 2014, p. 46, for the point that the presence of ashes that have no market potential and cause severe environmental impacts may hinder the possibility of carrying out a profitable WtE operation.
Even though these criteria focus on issues that belong to the higher levels of the waste hierarchy, such as preparing for re-use and recycling, there is also a place for WtE production in the regulation of EoW. Using heterogenic waste streams that have a high energy content may result in better overall environmental impacts when they are used as fuel products than would be the case if they were subjected to material recovery processes, taking into account the life-cycle of the material and the necessary separation mechanisms.\textsuperscript{780} In certain Member States some standardised WtE fuels have already ceased to be waste on the strength of these criteria.\textsuperscript{781} At EU level there has been opposition to WtE materials ceasing to be waste but the ability to regulate this matter at national level still remains, provided the measures taken respect the criteria set in Article 6 of the WFD.\textsuperscript{782}

It is clear that the first EoW criterion set out in Article 6 of the WFD is fulfilled in WtE operations because MSW-based fuel products have a very specific purpose: they are burned in order to produce energy. In addition to that, a large number of energy plants can utilise MSW, RDF and SRF in energy production in a profitable way: there is a clear market and demand for the use of waste in energy production. The assessment of the two first criteria has to take into account the national (or regional) capacity to utilise waste as energy. If the material were to cease to be waste that would be likely to promote additional use of waste-based materials in energy production since the infrastructure required for the installation would be simpler and cheaper for the operator. The reason for this is that they would no longer be hampered by bottlenecks caused by waste status, such as the combustion heat, combustion gas purification requirements etc., which apply to waste incineration, but could incinerate waste as is the case in respect of any other fuel products.\textsuperscript{783} The crucial issue regarding the first two EoW criteria is to ensure that EoW status is not simply a means of circumventing the waste disposal legislation.\textsuperscript{784}

The specific rules for WtE laid down in the IED are drafted in order to ensure a high level of protection of the environment and of human health and to avoid transboundary movements of waste to plants operating at lower environmental standards.\textsuperscript{785} Therefore, where these specific rules are not based on actual reductions in environmental and human health impacts, they should be considered as unwarranted bottlenecks that hinder the recovery of waste. In other words, where it can be shown that burning MSW-based fuel products does not cause overall adverse impacts on the environment or on human health, even when they do not comply with the obligations laid down in the IED on combustion heat and smoke gas purification systems, the additional measures for burning ‘waste’ contained in the IED should not apply.


\textsuperscript{781}E.g. Italy, UK.


\textsuperscript{784}JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 6. However, if the need for heat is low in the country where the operation is located, the market situation might be somewhat more difficult since WtE operations are rarely profitable if they only produce electricity.

\textsuperscript{785}Recital 34 of the IED.
However, consideration of the overall impacts of burning waste should take into account that the impacts of the substitution of virgin fuel products with waste are highly dependent on what virgin fuel products are being substituted. MSW-based fuels are usually considered to substitute fossil-based fuels in co-incineration plants. The main point of the third criterion is that it is possible to use the material in a lawful manner after it ceases to be waste. After the regulation on waste stops applying to a substance or object, all the other legislation that would apply to similar products starts to apply to it. Hence, it can be ensured that the EoW product can actually be used in the same way as its virgin counterpart. The criterion of environmental acceptability extends the objectives of the third criterion to ensure that material that ceases to be waste does not cause any adverse impacts on the environment or on human health. The criterion requires that the object or substance cannot cause more environmental or human health impacts after it ceases to be waste compared to the situation when it was still classified as waste. The impact assessment must also take into account the life-cycle of the product and the positive impacts resulting from the material ceasing to be waste, such as the reduction of emissions from landfills and a reduced need to extract new raw materials for fuel products.

It appears that where it is possible to control and monitor the impacts on the environment and on human health of WtE operations MSW-based fuels can achieve EoW status if there are no explicit restrictions on their doing so or on using the waste material in such installations. Emission control can also be achieved by restricting the use of EoW fuels to installations that hold environmental permits, thus allowing for closer scrutiny of their emissions. However, due to MSW’s heterogeneity, not just any MSW going to energy production can cease to be waste, since the consistency of the fuel and the emissions caused by incinerating it are unpredictable. That said, if its consistency and emissions can be controlled, there are no barriers to EoW status. For example, the standards for SRF might function as a means of ensuring the quality of MSW-based fuel products. The bottom line is that in the absence of standards to control the emissions caused by incineration, MSW cannot cease to be waste. The quality assurance standard does not have to be the EN-standard for SRF but basically any standard under which adverse environmental and human health


787 E.g. In C-358/11 Lapin luonnonsuojelupiiri, the CJEU ruled that the characteristics of the CCA saturated poles were regulated thoroughly enough via Regulation (EC) No 1907/2006 (REACH).


790 See Letter to the European Commission and decision makers: Requirement for consistent application of pollution prevention by ensuring that Waste Derived Fuels (SRF and RDF) comply with the strict waste rules and are NOT a candidate for End-of-Waste (EoW). CEWEP 2014, pp. 1–3. According to the participating organisations, as a result of this petition, the Commission should ensure that SRF will not be the subject of EU-wide EoW legislation.
impacts can be avoided. The necessary quality assurance mechanisms could be put in place in the applicable legislation.

Legislation on SRF or similar waste-based fuel products could be highly advantageous in terms of recovering MSW more efficiently. Clinical tests have shown that 72% of MSW can be recovered as SRF, while 3% of the stream can be recovered as metals, 11% separated as reject materials, 12% as fine fractions, and 2% as heavy fractions. In addition to that, nearly three-fourths of MSW could be recovered as SRF and, assuming that appropriate legislation was in place, used as non-waste in energy production. The difference in the amount between the MSW applicable for RDF status and the MSW applicable for SRF status is not big and, because of this, EoW status could provide the necessary incentive for WtE installations to achieve SRF status and produce lower emissions.

5.4 SHIPMENT AND SUPPLY OF MSW

Shipments of waste play an important role in relation to producing energy from waste. Some Member States have an overcapacity of WtE production while others have no capacity at all and also have high landfill rates. These uneven capacities are usually compensated for by shipping unrecyclable waste to Member States with high capacity for energy production. This is beneficial both for Member States that get rid of their unrecyclable waste and for those that receive more fuel products in order to improve their self-sufficiency in energy production. The transportation of low value waste streams over long distances is usually not lucrative and therefore such waste streams are often used near where they are produced. This is also often true of MSW and its transportation.

In most shipments of waste, MSW is considered green list waste and the difference between shipping it as waste or as non-waste is not that big. Nevertheless, it is unlikely that MSW or MSW-based fuel products would be shipped from one Member State to another as non-waste. The reason for this is that even though the EoW criteria may be available, the national rules on EoW will only apply in the Member State in question. The principles of self-sufficiency and proximity mean that municipalities could prohibit shipment of their municipal waste to other locations and incinerate it themselves. Member States may prohibit the shipment of waste for disposal on the basis of the principles of proximity and self-sufficiency if the same level of environmental protection cannot be ensured in the management process. This gives municipalities a strong position in terms of controlling their own MSW streams.

The connection between the self-sufficiency of municipalities and producing energy from MSW and MSW-based products is only relevant in relation to transboundary movements of waste. Regulation (EC) No 1013/2006 does not lay down an extensive legislative framework for shipment and transportation of waste inside Member States and therefore these movements cannot be controlled through the restrictive

782 Nasrullah 2015, p. 51.
783 See European Commission: Roadmap to ‘Exploiting the potential of waste to energy under the energy union framework strategy and the circular economy’. European Commission 2016, pp. 2–3.
785 See Krämer 2016, p. 383.
implications of the principles of self-sufficiency and proximity. WtE operations are material-intensive and therefore it is essential to ensure the availability of a sufficient amount of feedstock so that the facilities can function. Ergo the availability of MSW is a conclusive factor for the profitability of a WtE facility. However, given the potential to govern the actions of many different waste suppliers, it is crucial that the supplied materials can be used in the production process, taking into account technical issues as well as the impacts on the environment and on human health that each facility may have.

5.5 WTE AND OFF-SPECIATION MATERIALS

It is possible that a supplier, for one reason or another, may supply an operator with materials that do not meet the standards agreed upon, and thus provides the operator with off-specification materials. The CJEU has addressed many of the issues thrown up by such situations. In Shell\(^{796}\) the question for the CJEU was whether, in the light of the definition of waste set out in Article 3(1) of the WFD, the fact that the holder of off-specification materials supplied had no use for them made them waste even though the operator could use these materials.\(^{797}\) This type of situation may arise if the waste supplied does not fulfil applicable standards. The off-specification material may be commercially unusable or could even damage the plant’s facilities instantly or over a period of time.\(^{798}\)

The CJEU ruled that the redundancy of the material alone was not enough to constitute the waste status.\(^{799}\) It held that since the supplier had taken the material back in order to mix it with another product and to release it onto the market, the material was not classifiable as waste.\(^{800}\) The decisive issue in respect of the status of off-specification material was whether the operator had returned the product to the supplier and obtained compensation in accordance with the sales contract, and at no point was planning to discard it.\(^{801}\) The argumentation of the ruling showed traces of textual argumentation taken in regards to the concept of ‘waste’: it was important that the holder of the material was not intending to discard it. The argumentation also followed the telos of the regulation as the ruling highlighted the fact that redundancy of the material did not constitute ‘intend to discard’ when the supply of the material was not carried out according to the agreement between the parties involved.

Receiving or supplying off-specification material in WtE operations is a different matter. In Shell it was clear that the material itself was not waste in legal terms: the question was whether its redundancy to the operator would be a sufficient ground for its having waste status under the definition of waste contained in Article 3(1) of the

\(^{796}\) C-241–242/12 Shell (2013) ECR 821.

\(^{797}\) A similar question is posed in Request for a preliminary ruling in C-624/17 Tronex.

\(^{798}\) See Roberts, Peter, Gas and LNG Sales and Transportation Agreements: Principles and Practice, Sweet & Maxwell 2011, p. 345.

\(^{799}\) C-241–242/12 Shell (2013) ECR 821, paras. 44–45.

\(^{800}\) C-241–242/12 Shell (2013) ECR 821.

WFD. In WtE operations it is clear that the MSW supplied to the operation is in fact waste, if not regulated differently. Therefore, it may be problematic if the operator is supplied with a stream of MSW that does comply with, for example, the SRF quality standards or the R1 energy efficiency standards. At that point the operator would find itself supplied with a product that it does not need and which is in fact waste. This might create problems regarding the holder’s responsibilities and the return transportation of the materials. If the installation cannot comply with the efficiency standards with the waste that it is supplied with, the operation is a disposal operation instead of a recovery operation.

There are three typical scenarios in which the responsibility or requirement to pay compensation arises: (1) where the operator knows that the material is off-specification but still takes it; (2) where the operator knows that the material is off-specification and thus does not take it; and (3) where the operator does not know about the off-specification nature of the material and therefore takes it. The supplier and operator can prepare contract clauses that deal with the division of responsibilities in these situations. However, the general rule is that in situation (1) the operator is not entitled to compensation,\(^{802}\) while in situation (2) the operator has the right to refuse to take the delivery and the situation will be similar to a shortfall in supply on the part of the supplier; and in situation (3) the operator is entitled to compensation.\(^{803}\) In some cases, situation (3) can also be seen as a shortfall in supply on the part of the supplier or may be resolved by the operator not paying.\(^\text{804}\)

### 5.6 RECYCLING TARGETS

Article 11 of the WFD lays down the re-use and recycling targets to be achieved by 2020. Member States are to take the necessary measures designed to achieve these targets. First, ‘by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight’. Higher targets are laid down for municipal waste in 2025, 2030 and 2035. Second, ‘by 2020, the preparing for re-use, recycling and other material recovery,\(^{805}\) including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of wastes shall be increased to a minimum of 70 % by weight’. Member States should consider the recycling targets when assessing departures from the waste hierarchy since the targets are binding and the hierarchy itself only seems to constitute a best efforts obligation.

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\(^{802}\) The problem with situation (1) is that it is not clear what constitutes ‘knowing’.

\(^{803}\) Situation (3) is affected by problems similar to situation (1) since it is hard to define what ‘knowing’ is and what can be expected to be noticed at the delivery point.

\(^{804}\) Roberts 2011, pp. 346–349.

\(^{805}\) See COM (2015) 595, p. 18. In the Commission’s proposal the words ‘other material recovery’ have been replaced with ‘backfilling’. This amendment would rule out all other possible material recovery operations from the recovery operations that can be included in the recycling targets in respect of C&D waste.
The targets apply only to preparing for re-use, recycling and other material recovery. Since other material recovery does not cover energy recovery and reprocessing into materials which are to be used as fuel, waste-to-energy operations cannot be utilised in either of the targets. Recycling targets basically only take preparing for re-use and recycling operations into account in the quotas. Backfilling operations can also be taken into account in the targets for C&D waste. The recovery and recycling target for household wastes deals with the same waste streams as do the operations using MSW.

The recovery and recycling targets ‘for MSW’ laid down in Article 11 of the WFD are based on the recovery rate of the volume of the material in weight. This makes sense for MSW in energy production, as it is often used in high volumes in WtE operations. However, Article 11 specifies that the different waste streams inside the overall MSW waste stream should preferably be utilised as materials. Considering the need to separate different homogeneous waste fractions from the MSW stream, it makes sense to limit the recovery targets to only counting preparing for re-use and recovery. If energy production could be counted towards these targets, the material recovery potential of these homogeneous waste fractions would remain untapped. Waste streams such as paper and glass can easily be utilised on higher levels than other recovery and it makes sense to encourage this option through binding targets.

Creating binding targets for energy production of waste does not make sense if it cannot be verified that only wastes that are unfit for material recovery will be burned and that they will only substitute fossil fuels and not, for example, clean renewable fuels. The fact that MSW is often inadmissible to materials recovery, however, could promote its utilisation in energy production as well as its environmentally friendly waste treatment. On the other hand, where WtE operations are concerned, low quality, heterogeneous waste streams can substitute virgin fuel products because of the huge demand for fuel that stimulates energy production. Nevertheless, in situations where waste is suitable for efficient material recovery its recovery as energy should be avoided. A significant amount of that kind of materials are used in energy recovery operations and disposed of due to a lack of an adequate or economically viable collection and separation route.

### 5.7 SUMMARY

The waste hierarchy indicates that recovering waste as energy is the best option when the waste cannot be recovered as a material. Utilising MSW as an fuel products can be justified on grounds of heterogeneous consistency. Valuable waste streams that

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808 For more on this, see Turunen & Van Calster 2016.

809 Many fractions of MSW could be utilised as materials but their separation from the overall mixed waste stream is not economically viable.
should not be burned are often sorted and separated from the large fractions prior to the incineration. After separation the MSW is usually processed into RDF or SRF by shredding and dehydration to ensure its safe and efficient incineration. RDF is the generic name given to processed MSW that is ready to be used in energy production. SRF is also a processed fraction of MSW but its high quality and non-hazardous properties are assured through an EN quality standard.

In material recovery operations, recovery status is often based on the level of substitutability between virgin and waste-based materials, which is measured through the energy efficiency of the power plant. The more energy can be produced from a certain amount of waste, the more it can substitute alternative (fossil) fuels in energy production. Drawing a line between incineration for energy and disposal should be done in accordance with the Annexes to the WFD. R1 operations are considered recovery and D10 operations are considered disposal. R1 means that the waste is principally used as a fuel or other means to produce energy. Whether the use involves ‘principally’ producing energy can be evaluated by reference to the following features: (1) the amount of energy produced must be larger than the amount of energy consumed in the operation; (2) the surplus energy produced should be used in producing heat or electricity; and (3) the waste should be mainly used as a fuel or other means of producing energy.810 A strict standard for the recovery status of incinerators using MSW is laid down in the footnote on R1 in Annex II to the WFD.

In the R1 formula the heat and the electricity produced by burning waste are counted but preference is given to producing electricity. In some Member States and areas, it has been hard to achieve the R1 threshold because the existence of a warm climate and lack of an adequate district heating grid makes it impossible to utilise the heat energy produced. Taking into account that even semi-efficient WtE facilities usually provide better overall environmental impacts than waste disposal, the EU has enacted legislation on CCF. CCF can multiply the efficiency of the facility in R1, and they apply to Member States and areas that have a low number of heating days and a low demand for heat energy.

It is also important to consider whether the MSW or MSW-based product can be excluded from the concept of waste. Since MSW and MSW-based products are usually not considered production residues, they cannot be considered by-products. The supply of MSW usually comes through public or private parties selling their mixed waste streams to publicly or privately owned WtE facilities. The distinction between waste and non-waste fuels for WtE is drawn in accordance with the EoW criteria laid down in Article 6 of the WFD. MSW-based products could fulfil the criteria. Nevertheless, for MSW to cease to be waste it must fulfil the criteria set out for similar non-waste products and its use must be environmentally acceptable. This cannot be ensured without extensive control and the use of quality assurance procedures. As the concepts of MSW and RDF do not provide for any standards, EoW status is only available for SRF or other fuel products that are subject to binding quality standards.

Producer gas manufactured from wastes can also be subject to the legislation covering burning waste even though waste legislation does not usually apply to gas. However, if the emissions produced by burning the gas can be kept low, it is possible for the gas to be excluded from the scope of application of legislation on the burning of waste.810

810 C-228/00 Commission v Germany (2003) ECR I-1439. See Evers 2015b, p. 135. See also Guidelines on the interpretation of the R1 energy efficiency formula for incineration facilities dedicated to the processing of municipal solid waste according to Annex II to the WFD, European Commission 2011.
wastes. At EU level this issue is regulated in an unclear and irrational way. However, there is scope for more specific legislation enabling the burning of producer gas as non-waste to be enacted at national level, and such legislation already exists in some Member States.

Article 11 of the WFD lays down recovery targets for household wastes. However, these targets are largely based on recovering the separable and recoverable fractions of the waste streams, such as glass and metal wastes. Recovering them as materials before the incineration process makes sense economically and should be done in accordance with the waste hierarchy. The targets set out in Article 11 of the WFD could apply to MSW as a large portion of it comprises household wastes but this article only covers preparing for re-use and recycling the materials. Producing energy from waste cannot be counted towards the recovery quota.

In the light of the circular economy, WtE can be seen from two perspectives: (1) burning waste inadmissible to material recovery in order to produce energy represents sound practice due to the environmental and human health advantages gained through so doing; or (2) the practice of burning waste should be limited due to the fact that it ends the life-cycle of the substance or object. MSW or other mixed waste streams could still be recovered through better technology and separation techniques. However, in view of the lack of viable infrastructure it is justifiable to burn mixed waste streams for energy production where the alternative waste management option is landfilling or burning without energy production.
6 CONCLUSIONS

6.1 GENERAL CONCLUSIONS

Achieving the objectives of the circular economy is a project that requires a great deal of technical and regulatory innovation as well as changes in attitude. The endeavour to create a circular economy and close the loop still lacks many crucial building blocks. This dissertation has examined the legal framework controlling the recovery of waste and guiding the waste streams, emphasising the concepts of waste and non-waste and the scope of application of the WFD. However, where there is no technically viable manner in which to recover waste and return it to the production loop, legal instruments and arrangements do not offer much comfort.

Efforts to achieve the circular economy can also be made outside the scope of waste legislation. For example, addressing the durability and reparability of products, reinforcing the demand for waste-based materials and improving product (and life-cycle) design can only be carried out through product legislation. The objectives relating to the waste legislation mostly relate to the development of the waste hierarchy and its implementation methods.811 Enlargement of the scope of application of the legislation on eco-design beyond the energy consumption of certain products is a further step that could be taken.812

There are many important factors to be taken into account in harnessing waste as a resource in addition to legislation on the concept of waste. The collection and separation of waste also play a key role in waste management and in guiding waste streams to recovery. Furthermore, for many waste streams, people’s consumption habits have a significant impact: more efficient waste treatment options are unavailable for waste streams that cannot be separated from a huge mass of mixed waste. This issue could also be addressed by means of informational guidance. However, this dissertation has focused on the command and control mechanisms and the incentives and the barriers that they provide for the circular economy.

The definitions set out in the waste legislation constitute a key element of developing waste management in the EU. Many of the concepts used are operational in nature and their interpretation makes a huge difference in the choices that are made in waste management. Refraining from solely applying the strict textual interpretations of the provisions is a clear possibility to promote the circular economy strategy. This dissertation has examined the key concepts set out in waste legislation: i.e. waste and non-waste as well as recovery and disposal operations. This was done by interpreting and systemising the legal provisions on the by-product and EoW criteria laid down in Articles 5 and 6 of the WFD.

The application of these and other instruments of waste legislation was analysed by reference to studies of specific topics: two on material recovery from waste and one on energy recovery. The material recovery studies concerned the recovery of copper

811 EEB: Circular Economy Package 2.0: Some ideas to complete the circle. European Environmental Bureau 2015, pp. 3–8.

and copper alloy scrap and the recovery of rare earth elements. These two topics were chosen to demonstrate that the stage of establishment of the recovery schemes plays a key role in the extent to which waste treatment options can be developed within the framework of the basic concepts of waste legislation. The analysis of energy recovery focused on MSW and fuel products produced from MSW such as RDF and SRF. This analysis showed that the legal framework also provides possibilities and even incentives for more efficient recovery options in relation to other recovery operations alongside developing material recovery schemes.

The following chapter presents theses on the interpretation of the concept of waste and the functionality of the legal system. These do not encapsulate the entire content of the dissertation but aim at providing the reader with an overall analysis of the importance and interpretative possibilities of the concepts contained in the WFD, such as waste and non-waste as well as recovery and disposal operations, and to offer an answer to the research questions presented at the beginning of the dissertation.

6.2 INTERPRETATION OF CONCEPT OF WASTE AND NON-WASTE

6.2.1 Conclusive characteristics of ‘waste’

This chapter offers conclusive views of the interpretation of the concept of waste and the burden of proof connected to it, hence it directly answers the first research question of this dissertation by providing general rules on assessing all the listed concepts: waste, by-product and waste. It has been argued multiple times in this dissertation that the concept of ‘waste’ easily tends to be over-inclusive if it is interpreted along the lines of textual interpretation of Article 3(1) WFD. The over-inclusive scope of application can function as a barrier for reaching circular economy objective as is explained earlier. The list of wastes set out in Decision 2000/532/EC does not provide exhaustive (or even very descriptive) rules on what should be considered waste: the substances or objects found in these lists are not necessarily wastes and certain materials not found in the lists can also be considered waste.813 Lists of waste are basically only useful when the materials have already been defined as waste.

Waste legislation should aim to remove additional requirements in respect of waste where doing so does not increase the negative impacts on the environment and on human health caused by the waste. This either means that the waste can be used as non-waste due to its non-hazardous properties or that the properties and impacts of the waste material can be controlled through the legislative framework that regulates similar non-waste substances or objects. The key task of regulating with a view to closing the loop is that of identifying waste streams in respect of which the control exercised under waste legislation is merely a ‘redundant’ barrier that impedes recovery operations.814


814 Extensive national and EU-wide waste stream studies are needed for progress to be made towards the achievement of the circular economy and closing the loop, even in respect of easily recoverable waste streams.
Waste status should be a ‘sanction’ imposed in relation to waste-based substances that cannot be utilised in the same way as virgin materials without giving rise to adverse impacts on the environment or on human health, and which therefore need to be regulated under a stricter precautionary regime and made subject to emission control. The designation of waste status should not have a positive implication in terms of the utilisation of substances or objects. It should be interpreted in a wide sense and exceptions from it should be interpreted narrowly.

There are three reasons why a material might acquire waste status. First, according to Article 3(1) waste is something that is being discarded, intended to be discarded or required to be discarded. Substances and objects that are destined for recovery can also be considered waste as they are discarded but, in material recovery, they are recovered to be put to new purposes of use. In a sense, final waste status can only attach to substances and objects that are not returned to a production process but are, in fact, abandoned or destroyed. The conclusion that waste is unnecessary can be reached. As Gillespie has stated in his ‘five certainties of waste’, waste is wasteful, as material can be waste although it could still have been used in a recovery operation and its value-chain could have been efficiently extended.

Second, the concept of waste is deeply rooted in the precautionary principle, which allows the concept of waste to be interpreted widely. The scope of application of waste legislation is ruled out for by-products and EoW products since they are not considered to be waste. Exclusions from the scope of application of the additional control mechanisms laid down in the waste legislation to by-products and EoW products are strongly based on the decisions constituting their non-waste status showing that they do not pose a risk of adverse impacts on the environment or on human health. Thus the uncertainty that triggers the application of the precautionary principle is removed and waste materials can cease to be waste. By default, the substances and objects that are discarded should be considered waste. However, if it is shown that the recovery operation can be carried out without environmental harm being caused, such substances and objects could possibly cease to be waste. Therefore, substances or objects that have unknown properties and impacts should be considered waste.

Lastly, the substances or objects are non-waste if they are used in an environmentally acceptable way. This is directly regulated in the by-product and EoW criteria. Therefore, it is not sufficient for adequate information to be provided about the substance or object ceasing to be waste, since what that information tells us also has to be taken into account. Substances and objects need to be environmentally acceptable

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816 However, there are poorly formulated regulatory frameworks in which waste status has positive impacts on the use of certain substances. See Romppainen, Seita & Kankaanrinta, Nora, ‘Arvioita biopolttoaineiden kestävyyttä ja kestävyyden osoittamista koskevasta sääntelyjärjestelmästä’, Ympäristöjuridiikka 2/2014, p. 75 (only available in Finnish): In Finnish legislation, biofuels that are still considered waste (not waste-based non-waste products) are counted twice in the national distribution quota for biofuels.
817 For more on the five certainties of waste see Gillespie 2015, pp. 8–70.
818 Exclusions from the concept are interpreted narrowly as exceptions are by default.
819 Environmental acceptability can be achieved in two ways: first by legislating to bring about a completely safe waste stream environmentally acceptable use of which is automatic due to its lack of hazardous properties; or second by regulating the waste stream in such a way that its properties are sufficiently controlled to ensure that no adverse impacts on the environment or on human health are produced.
in order to cease to be waste. The conclusion that waste status should be based on the negative environmental or human health impacts of the substance or object instead of over-inclusive interpretations of the concept of waste as laid down in the WFD is well founded. Materials given waste status should be those that are dangerous to the environment or to human health and whose use is not environmentally acceptable.

In addition to the concept of waste laid down in Article 3(1) of the WFD, the classification of waste should be based on the above-mentioned factors in order to create a level playing field between waste-based materials and virgin raw materials. For the waste legislation to function properly, the concept of waste needs to have two different qualities. First, it should be capable of being interpreted widely enough to allow for legislation on the unknown and dangerous elements of the waste and to steer substances and objects towards adequate waste management where necessary. Second, it should not prevent the efficient recovery of substances and objects that are waste merely because they have been discarded. Waste status that is not based on the dangerous or unknown features of the substance or object simply creates bottlenecks impeding its recovery and hinders the achievement of the aims of waste policy and the completion of the circular economy. If waste is being recovered safely and there is adequate information about the impacts of the waste and the operations to which it is being subjected, it should not be considered waste. After its ceasing to be waste, a new life-cycle begins for the product. It is considered waste once again when discarded, at which point the concept of waste set out in Article 3(1) of the WFD applies once more.

Figure 8. Factors for declassification as waste.
The textual approach to the current formulation of the concept of waste in the WFD, clearly sometimes leads to over-inclusive nature of the concept, therefore the systems of exclusions (by-product and EoW status) are necessary. A more dynamic concept of waste without the exclusions would not however probably be feasible as it would make it harder to classify substances or objects as waste and therefore assuring the high level of environmental and human health protection would be harder. The factors presented in this chapter emphasise the points that need to be taken into account in the systematic and teleological interpretation of the criteria for by-product and EoW.

6.2.2 The relationship between by-product and EoW status

A substance or object that would normally be considered waste can be classified as non-waste if it is classified as a by-product or ceases to be waste pursuant to the EoW criteria. Classification as a by-product is mostly based on the case-law of the CJEU on the application of the concept of waste. The relationship between the by-product and EoW categories further answers the first research question of this dissertation by systemising the relation and hierarchy between the exclusions from the concept of waste. The application of the criteria for non-waste status set out in Articles 5 and 6 of the WFD is illustrated in the following figure.
Material is waste

Has it undergone recovery?

Is it commonly used for a specific purpose?

Does market or demand exist for it?

Does it fulfill the existing legislation and standards applicable to products?

Does its use lead to overall adverse environmental or human health impacts?

Material is not waste

Production process

Product

Life-cycle

Production residue

Material is considered waste. Can apply for end-of-waste status (See the left track)

Is its further use certain?

Can it be used directly without any further processing other than normal industrial practice?

Is produced as an integral part of a production process?

Is the further use lawful and does not lead to overall adverse environmental or human health impacts?

Yes

Yes

Yes

Yes

Yes

No

No

No

No

No

No

No

No

No

No

No

Yes

Figure 9. Waste or non-waste.
Both sets of criteria provide means by which substances or objects can be removed from the scope of application of the concept of waste and the waste legislation. Nonetheless their application is clearly divided: by-product status applies only to production residues, while EoW status can apply to any substance or object that is considered waste.\textsuperscript{820} Because by-product status only applies to production residues, it cannot apply to consumer wastes. It can only apply to substances or objects created in the production process of another product. In a sense, it provides a smaller recovery loop than EoW status where the substance or object can first be utilised by multiple consumers.

By-products are never considered waste. Technically by-product status is an conceptual form of waste prevention. The production process produces the main product, production residues that may be waste or by-products and waste.\textsuperscript{821} In turn, EoW criteria only apply to substances and objects that are already classified as waste, which, provided they fulfil the EoW criteria, can cease to be waste after going through a recovery operation. This means that by-product status should be preferred over EoW status when both sets of criteria apply. Of course, by-product status is not even available for most waste streams. If a substance or object is already classified as a waste, only EoW status can apply to it. By-product status can also come into play if it is unclear whether the material has yet been discarded, whether its holder intends to discard it or is required to discard it. As prevention measure by-products also bypass EoW products in waste hierarchy.

The end result of both regulatory routes for non-waste status is the same: the substance or object is not considered waste and waste legislation does not apply to it.\textsuperscript{822} After being classified as non-waste, the substance or object falls under the legislative framework that governs similar virgin products and materials. Whether the waste status ends at the point of its generation or after recovery may have a significant impact in some cases: legislation on the storage of waste permits a longer storage period for waste for recovery than for waste for disposal.\textsuperscript{823} Situations in which both sets of criteria can be fulfilled are quite rare. However, in the event of such a situation arising the production residue must be considered a by-product instead of an EoW product or waste. The relationship between the two regulatory routes for non-waste status is illustrated in the following figure.
Figure 10. The relationship between by-product and EoW status in material recovery.

The figure does not provide the most accurate visualisation of the position of waste streams destined for a WtE operation: WtE is a sort of final solution after which it would seem misleading to talk about new life-cycles through recovery as the remaining fractions are mostly ashes produced by incineration. Therefore, the material does not continue in circulation as such. The circular aspect is lacking from the WtE solution: a WtE operation can be subjected to all the possible stages during the life-cycle (waste, by-product, EoW). It is a linear solution to recover the waste and end its life-cycle in the process. It can be justified in the waste hierarchy and in circular economy terms if the waste has dangerous properties and therefore cannot be re-used as a material. Considering the current regulatory framework, it should also be taken into account that the recovery of wastes from disposal operations such as landfilling is rather complicated. The use of continuous cycles of recovery would seem to offer the most straightforward way to achieving multiple life-cycles. However, the starting point in the definitions of waste legislation has to be that waste status is never permanent and all wastes can cease to be waste providing they fulfil the criteria of Article 6 of the WFD.

However, many waste streams end up ‘slipping through the cracks’ and do not live up to their full potential under the priority order set out in the waste hierarchy. For example, MSW is the most common WtE waste stream because its material recovery has proven to be disproportionally expensive compared to recovering its calorific

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824 There are exceptions such as the coproduction of fertilisers and energy through composting.
825 Including the separation of the waste fractions that are available for material recovery.
value in WtE operations. In a fully implemented circular economy, WtE operations should not be used if the properties of the material do not require them. They are permissible where the waste is dangerous and needs to be disposed of or the quality of the material is poor (due to multiple life-cycles and recovery loops) and it can no longer reach the quality standards necessary for its material recovery. The use of linear solutions in waste recovery due to lack of recovery infrastructure and poor separation should be phased out in the future with a view to perfecting the circular economy.

While the two routes to non-waste status often apply to different kinds of waste streams, the criteria used and the procedures followed are similar. Decisions on both by-product and EoW status can be made at EU level in under the examination procedure, at national level, and on a case-by-case basis. National provisions can be drafted for waste streams that are not regulated extensively at EU level and decisions can be made on a case-by-case basis if EU or national measures have not been laid down.

There are benefits to each of the procedures at these different levels. The highest possible level of applicability and legal security can be achieved by regulating substances or objects and their waste status at EU level. In addition, EU-wide standards are beneficial for the functioning of the internal market. Nonetheless, regulation at EU regulation is possible only in relation to waste streams that are commonly used throughout the whole of the EU and where there is the political will to draft the necessary legislation. The use of national regulatory techniques opens up the possibility to bypass the EU, in view of its passivity in this area, and regulate smaller waste stream that are important in order to boost the national economy and meet national regulatory targets.

Provisions laid down at national level are, however, only applicable in the Member State in question and have no effect in other Member States. Where neither EU nor national legislation exists, case-by-case decisions on the waste status can be made. Traditionally, case-by-case decisions on by-products are rather common but they can also be made in relation to EoW status. EoW decisions made on a case-by-case basis only apply to waste streams and operator(s) subject to the decision per se. Decisions on by-product status are well suited to being made on a case-by-case basis as the criterion of further use is applied rather strictly and a material’s production residue status is connected with the factual operation of the production facility and the technical choices made in the production process.

The sets of criteria for by-product and EoW status are quite similar. Both sets of criteria aim to ensure that the substance or object is being used in a beneficial operation as a raw material and is not being removed from the classification of waste merely to circumvent the rules governing disposal of waste. The criteria also seek to ensure that use of the substance or object does not give rise, or have the potential to give rise, to the risk of adverse impacts on the environment or on human health. This demonstrates that the waste legislation that applied to the substance or object prior to its exclusion from the concept of waste was not necessary in order to ensure a high level of protection of the environment and human health. Both sets of criteria also contain a criterion that ensures that the end result of the declassification of the material as waste can be used lawfully in accordance with the same provisions as apply to similar non-waste products. This criterion creates a link between ensuring an adequate level of protection and ensuring that the material can be used for the planned purpose of use.
Neither by-product nor EoW status are limited to use as a raw material although such usage is preferred under the waste hierarchy over other (energy) recovery operations and disposal.\footnote{Technically by-products are not recovered but their classification as waste is prevented and therefore the positioning their use in waste hierarchy is somewhat irrational as they are not waste. However the same core idea can be applied to by-products as is applied to waste through policies and strategies of material efficiency.} However, interpretations that hinder the ability to use waste in production processes should be avoided if they cannot be justified by reference to a high risk of negative impacts on the environment or on human health. Waste legislation and policy have the dual objectives of protecting the environment and human health as well as efficiently closing the loop. Finding a balance between these two objectives is crucial in order to develop the legislation on waste, by-product and EoW statuses.

6.2.3 Importance of the definition of recovery

Although the key concept set out in the WFD is that of waste, the importance of the concept of a recovery operation should not be underestimated as it is essentially the conceptual route to harness waste back to production processes as a raw material. The concept of recovery is subject to wide interpretation and there is a great deal of CJEU case-law on this topic. Article 3(15) of the WFD defines recovery as any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. The recovery status of an operation is in essence based on a certain level of substitutability between the waste-based and virgin material.\footnote{Operations in which virgin raw materials are directly substituted by waste-based secondary raw materials are considered to be recovery operations, as are material efficient WtE operations in which the waste material in theory substitutes primary fuel products in the wider economy.} As stated above, the interpretation of 'recovery' and the usefulness of the purpose of use are heavily based on the systematic and teleological argumentation.

Article 6 of the WFD provides that EoW can only apply after the waste has undergone a recovery operation: all substances and objects subject to disposal operations are always considered waste. In EoW procedures the substances or objects only cease to be waste after being subjected to a recovery operation. In practice, the scope of a recovery operation may be interpreted quite widely: for example, even visually checking the quality of scrap metal can be considered preparing for re-use, which in turn is considered a recovery operation. On the other hand, the R1 formula lays down a strict energy efficiency standard that functions as a tool for use in deciding whether WtE operations in which MSW is burned are energy efficient recovery operations or energy inefficient disposal operations. The threshold for recovery operation status is often set quite low. Qualifying for recovery status involves clearing an evidential hurdle by providing adequate information that a sufficient level of interchangeability exists between the waste-based and virgin raw materials. Due to its direct connection to the concept of waste and EoW, the interpretation of the concept of recovery operation is an important 'prequestion' for the first research question on the possible interpretations of the key concepts of the waste legislation.
Recovery operation status also has significant impacts on shipments of waste. Only wastes destined for recovery operations can be considered green list wastes. Wastes destined for disposal are harder to ship for various reasons: amber list wastes go through the prior notification and consent procedure and shipments for disposal can be blocked on the basis of the principles of proximity and self-sufficiency. The procedure for the shipment of waste under the green list is rather light and does not differ that much from the procedure followed for normal shipment of non-waste products. On top of that, waste materials can be stored for three years prior to recovery, but only for one year prior to disposal. Limiting the time and place at which waste treatment can take place is likely to result in more inefficient solutions in terms of closing the loop than would be the case if more time and a wider range of options were available in respect of waste treatment.

The concept of recovery comprises multiple different operational categories laid down in Article 3 of the WFD and the waste hierarchy. The distinction between these categories does not seem to carry much weight, at least at the level of regulation. The legal infrastructures are built more on the distinction between recovery and disposal than on drawing a line between preparing for re-use or recovery. The current regulatory system emphasises the more efficient recovery categories for a few waste streams in the recovery targets but a comprehensive framework to facilitate a move from WtE or backfilling to more efficient recovery categories does not yet exist.

6.3 THE FUNCTIONING OF THE EXCLUSIONS SCHEME

6.3.1 Waste hierarchy as a guiding principle for circular economy

Article 4 of the WFD provides a general priority order for waste prevention, management legislation and policy, which is as follows:

(a) prevention;
(b) preparing for re-use;
(c) recycling;
(d) other recovery, e.g. energy recovery; and
(e) disposal.

This waste hierarchy is the principal means by which the circular economy is implemented under the current regulatory framework on waste. It should also be the starting-point for all waste management and treatment solutions. The hierarchy governs the waste management solutions that are available for different waste streams with a view to ensuring that they are treated in the most efficient way. Article 4(2) of the WFD provides that Member States may depart from the priority order contained in the waste hierarchy in order to make use of a waste management option that has a better overall environmental outcome as justified by life-cycle thinking. Moreover, in the context of this dissertation, the hierarchy should be recognised as the embodiment of the circular economy objectives pursued with the examined regulatory instruments. Therefore, the second research question on the functioning and the barriers of the legislation have to be assessed against this framework.
The waste hierarchy, the concept of waste and its exclusions are intertwined, as illustrated in Figure 11.

<table>
<thead>
<tr>
<th>Waste prevention:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Non-waste and a possible by-product</td>
</tr>
<tr>
<td>2. Cannot be counted in recovery targets</td>
</tr>
<tr>
<td>3. Substance or object is not discarded yet</td>
</tr>
</tbody>
</table>

The substance or object is discarded

<table>
<thead>
<tr>
<th>Recovery stage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Preparing for re-use, recovery and other recovery</td>
</tr>
<tr>
<td>2. Waste by default, end-of-waste by exception</td>
</tr>
<tr>
<td>3. Counted into the recovery targets</td>
</tr>
<tr>
<td>4. Choosing a means for recovery is often more practically guided than by the rules of the hierarchy per se</td>
</tr>
<tr>
<td>5. National politics and implementation show the impact of EoW regulation and the hierarchy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Disposal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Always waste</td>
</tr>
<tr>
<td>2. Can be means to remove dangerous substances from circulation</td>
</tr>
<tr>
<td>3. Often also subjected to substances and objects that are left out when closing the loop due to technical or economic barriers</td>
</tr>
</tbody>
</table>

Figure 11. The concept of waste in the waste hierarchy.

The waste hierarchy constitutes the key element for the further development of waste legislation and policy towards the objectives of the circular economy while providing guidance for the circular economy policies. Therefore it is taken as the measure for the evaluation of the effectiveness of the regulation and its achievement can be used as ground of achieving effet utile in systematic and teleological interpretation of the provisions. Nevertheless, the hierarchy is not without its problems. While providing the key elements for the implementation of circular economy principles in EU legislation, the hierarchy does not lay down concrete obligations. Member States are obliged to implement the hierarchy in their national legislation and are also afforded the possibility of creating binding rules for private actors. However, due to lack of clarity as to the obligations that stem from the hierarchy and the wide scope for interpretation that it allows, it is hard to derive concrete obligations directly from the waste hierarchy. In addition, it is rather easy for Member States to come up with excuses for not properly implementing the objectives of the hierarchy.

828 The hierarchy does not directly impose any obligations on waste management operators or other industry players, but their participation in the objectives of the hierarchy would be the best way to further its aims.
Waste prevention is another problematic aspect of the hierarchy. Waste prevention is not, for the most part, connected with waste legislation, which covers the generation of waste and management of waste that has already been generated. Wording of the provisions on the recovery targets of waste is unfortunate considering that waste prevention should be the ultimate target of waste legislation and the targets totally lack incentives towards it. For the most part, waste prevention does not belong to the legal systematic of waste legislation and many waste prevention actions are pursued by following better practices at the design stage of products and services. Legislation on waste mainly regulates waste treatment, i.e. recovery and disposal. Waste prevention falls in its own category and is not considered a waste treatment operation.

The interpretation of the waste hierarchy could also be developed in other ways. Creating a clearer distinction between the different stages would be an important improvement. The possibility to make departures from it on the basis of life-cycle thinking is an important tool that can be used to identify the most important waste management routes for different waste streams. Extensive waste streams analysis in respect of the life-cycle of different recoverable waste streams should be carried out in order to modify the hierarchy for best environmental treatment alternatives with the aim of arriving at a tailor-made priority order for a waste stream.

Recovery, collection and separation all have essential roles to play in meeting the recovery and recycling targets for the EU and its Member States. Article 11 of the WFD and legislation covering specific waste streams set out recovery and recycling targets for selected waste streams. Waste streams such as batteries and accumulators as well as WEEE streams have been chosen as recovery targets due to their complicated nature and the special knowledge needed to achieve their adequate recovery. Some waste streams, such as household wastes and C&D wastes, have been chosen as targets of similar legislation due to their environmental impacts and huge production volumes.

Calculation of whether the targets are achieved is done by comparing the volume of recovered waste fractions with the overall waste stream. The system is based on calculating weights and therefore does not provide a good incentive to recover certain fractions of the overall waste stream if they only appear in small quantities. For example, recovering rare earth elements from WEEE does not make a big contribution towards achieving the recovery target laid down because in percentage the amount of rare earth present in the whole product is very small. The recovery targets in respect of some waste streams clearly need to be rethought as they do not, at times, incentivise more efficient recovery.

Another problematic aspect of the recovery targets is that they do not factor in waste prevention. While waste prevention is the main aim of waste legislation, it is not taken into account in the calculation of recovery targets and the development of waste management mechanisms. Some mechanisms on calculating waste prevention have been created. However, until an EU-wide standard for the calculation of waste prevention is brought into existence it will be very hard to evaluate, on equal terms, waste that is not generated. Given the objectives of waste legislation, it would make

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829 See COM (2017) 33 final. Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions on the implementation of the Circular Economy Action Plan, pp. 5–6. However, solutions at the design stage may also have significant impacts on the recyclability and recoverability of the product. The waste hierarchy can be promoted through design and eco-design regulation by creating incentives to produce more durable and repairable products.

830 See De Römpf 2018a, pp. 255–258, for more on the problems of the regulation on the recovery targets.
sense for waste prevention measures to be factored into recovery targets. EoW products that have been classified as waste before recovery can be taken into account in respect of recovery targets but by-products cannot, due to the fact that they are not generated as waste but are considered as by-products from the outset.831

The waste hierarchy set out in Article 4 of the WFD can be used as a tool for assessing the functionality of the legislative framework. Waste management should be carried out in accordance with the waste hierarchy, which should only be departed from on the basis of overall environmental impacts and taking into account the whole life-cycle of the product. Life-cycle thinking may also amount to an important tool in respect of other waste recovery schemes: the distinction between waste and non-waste should be made in consideration of the environmental benefits that these options offer, not merely in line with the formalistic approach taken to the concept of waste in Article 3(1) of the WFD.

In the end, it will be up to the EU and its Member States as legislators, as well as national authorities, to decide on the extent to which the waste hierarchy and the objectives of the circular economy can be implemented. Within the existing regulatory framework, the waste legislation aims to ensure a high level of protection of the environment and of human health by creating control and monitoring mechanisms that may represent barriers to the use of waste-based materials instead of raw materials. The non-waste status of waste-based raw materials is beneficial in achieving the objective of closing the loop because removing the excessive control and regulatory burden involved in using waste-based materials encourages their use in place of virgin raw materials. On the other hand, the circular economy and waste hierarchy aim to direct waste streams into more efficient recovery operations and reduce the need for virgin raw materials by substituting them with waste-based alternatives.

As can be seen from the shortcomings highlighted in this dissertation, the existing provisions and incentives for better waste management are not sufficient to close the gap between waste and its utilisation in production processes. The waste hierarchy, provisions on ceasing to be waste, and recovery and recycling targets do not suffice to achieve the high objective of closing the loop. However, the existing mechanisms can incentivise and develop the current economy in a manner that brings it closer to achieving the objective of circularity.

The use of existing mechanisms upholds a clear possibility to be increase efficient resource economics and the circular economy. The EU and its Member States will have to use the possibility to legislate on the waste status of different waste streams through Articles 5 and 6 of the WFD. National regulatory authorities can influence or remove the bottlenecks standing in the way of using waste-based material in production that are solely attributable to their waste status. The EU also needs to take a more proactive approach towards the regulation of the waste status of commonly used waste-materials and by-products. EU-wide regulation is, after all, the key to bringing about a functioning trade in waste-based materials in the internal market and widening the scope of circularity.

In addition to legal innovations in respect of the governance of waste management and treatment, technical innovations are also crucial in order to utilise waste more

831 There are national differences as between the Member States regarding waste statistics and the way in which the targets are calculated, but from the perspective of EU legislation the above-mentioned solution should be preferred with a view to achieving uniform interpretation of EU law.
efficiently as a material. Technical innovations play a key role in functioning waste management and recovery: they have the potential to impact upon the collection, separation, treatment, recovery and disposal of waste and to reduce the impacts on the environment and on human health in each of the stages. Waste management can only go as far as the technical solution available. For example, technical development has played a key role in creating more efficient WtE facilities and energy recovery.

Another good example of the need for technical and legal innovations is presented by the possibility of landfill mining, which involves mining existing landfills to recover valuable waste-based materials from their ‘permanent’ location. Neither the current regulatory framework nor the technological innovations currently available are up to speed with the opportunities landfill mining presents. When the technology needed to carry out such mining is fully available, it will be necessary to enable the operations by legislative means to ensure that a better environmental outcome can be achieved through them. The position of landfills should be reconsidered as they could be regarded as material storage facilities from which efficient recovery could be achieved. The fact that the Landfill Directive currently sets a three-year limit for temporary storage for wastes destined for recovery together with the high separation costs involved in separating high-value waste fractions makes such mining activity somewhat complicated under legislation currently in force.

One way in which the objectives outlined above might be achieved is by taking a close look at the key definitions, such as those of waste and recovery, contained in the applicable waste legislation. Developing these definitions, while taking into account the need for a high level of protection of the environment and of human health, would be likely to be of benefit to all stakeholders. Legal innovations enable closure of the loop but technical development makes it possible to legislate on more efficient recovery operations that have a reduced impact on the environment and on human health.

6.3.2 Recovering fractions from waste streams

Provisions that exclude materials from the concept of waste can significantly impact upon those that apply to the utilisation of waste-based materials. The legislation governing this area offers new possibilities and incentives for more efficient material use and waste recovery by levelling the playing field as between virgin raw materials and waste-based materials. This dissertation has analysed three different waste streams and the conclusion must be that EoW and by-product statuses would appear to benefit the utilisation of different kinds of waste streams in different ways. The recovery rate in respect of rare earth elements seems somewhat immune to the substances or objects excluded from the concept of waste as both its recovery rate and recovery and separation technology remain undeveloped. However, the possible benefits that could accrue from the recovery of copper and copper alloy scrap are far from marginal. This chapter discusses the different compositions waste streams and the extent of interpretations of the provisions. It identifies barriers that cannot

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832 See e.g. ‘Intelligent assets: Unlocking the Circular Economy Potential’, Ellen MacArthur Foundation 2016, p. 50.

833 For more on this issue, see De Römph 2016, pp. 106–119.
be addressed through the interpretative theories of the key provisions. In this way, it answers the second research question of this study concerning the functionality of the legal scheme and the barriers for the circular economy.

The possibilities for EoW and by-product status only apply to the declassification of a specific waste stream or fraction of the waste stream. If the fraction is not homogenic, as waste streams containing rare earth elements often are not, it cannot be classified as non-waste because non-waste status requires a certain level of knowledge of the properties of the waste by way of quality assurance. This issue stems from the problematic aspects of waste separation and collection that reside in the fact that only waste streams that are separated at some point of the waste management process may be excluded from the concept of waste and be separately recovered.834 If the waste fractions are included in larger waste streams such as WEEE or MSW streams it is impossible to regulate their more efficient recovery through waste status without regulating the overall waste stream, which, in turn, often does not fulfil the criteria governing exclusion from the concept of waste. Waste collection and separation methods and their regulatory background should be altered in order to address these legal barriers.

There are other means apart from legislative routes by which to create functioning collection and separation schemes. Efficient collection and separation schemes often tend to develop for valuable waste streams.835 These kinds of waste streams are often supported by established collection and separation schemes to ensure a stable and secure line of supply of raw materials. Therefore, collection and separation routes can also be based on the economic benefits of recovering certain waste streams. Legislative routes are, in a way, more secure because sanctions may be imposed in the event of non-compliance with legislative provisions. In addition to collection and separation schemes mostly applying to high-quality and valuable waste streams, Member States have mainly sought to establish separate collection schemes where it is economically, technically and environmentally viable to do so.836

In respect of waste streams for which well-established recovery markets already exist, it is important to establish whether the material is considered waste or not.837 Case-by-case decisions on the waste status work better in relation to waste streams that have somewhat complicated collection and separation routes. For many waste streams, however, EoW or by-product status does not offer that many benefits: as the availability of the material is the direct result of its being adequately collected and separated, no separable waste fraction can exist without functioning collection or separation scheme.838 These waste streams might benefit from the possibility of case-by-case classification as non-waste. However, collection and separation schemes often

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834 As otherwise parts of the stream are unnecessary or their properties are unknown and potentially dangerous. See chapter 6.2.2.
835 Such as scrap metals.
837 See JRC Scientific and Technical Reports: End of Waste criteria, Final Report. European Communities 2009, p. 23. Deep understanding of the recovery chain is important: how the collection is structured, the treatment processing involved, the applicable legislation and the utilisation options in respect of the secondary material.
838 Including, among other things, functioning collection and separation grids as well as adequate technical equipment.
play a part at least as important as the mechanisms guiding waste treatment as do the classification mechanisms.

Waste management is at present often based purely on what is found to be most convenient in management operations. For example, mixed household wastes and plastics are widely used in energy recovery because no effective separate collection scheme exists for them. Their use in energy recovery is therefore not down to the fact that they have especially high energy content, but because it is more convenient to recover them in that way and because no effective obligations have been laid down for their separate recovery in higher-ranking operations in the waste hierarchy. In its communication on the circular economy and WtE the Commission proposed that the used of mixed wastes such as MSW in energy production should be phased out in the future and that where the waste management technologies that allow such operations cannot be utilised in an effective way Member States should not make long-term investments in them.839 Sahimaa also argued in his dissertation that 70 % to 80 % of MSW is recyclable and a better recovery rate could be achieved through separation of the different fractions.840 Despite the convenience of WtE alternative, it has to be concluded that, as De Römpf put it, ‘the Circular Economy transition is first and foremost a transition of the materials system – not of the energy system’.841

The lack of adequate take-back systems cannot be compensated through the regulation of EoW status. Other legal instruments promoting better waste management and circular economy are necessary as well. In order to regulate on the take-back system more efficiently further regulatory innovations aiming at circular economy will have to be stipulated. EoW materials reach the end of their life-cycle after the consumer stage and their efficient recovery requires an effective take-back scheme. The high number of different purposes of use and differentiated collection and separation schemes lower the probability of the waste material reaching one new recovery loop after another. It is possible that products manufactured from EoW materials may be discarded as mixed waste and therefore recovered as energy rather than as material. Especially if the material is used in small saturations, its separate recovery might be unviable. More comprehensive analyses of material flow and the life-cycles of the products are needed in order to prevent the benefits of regulating the declassification of waste from being limited to just providing one more life-cycle for the material. In the circular economy materials should be used as long as their quality allows for efficient recovery. The quality of some waste streams weakens during multiple life-cycles and their energy recovery at the point at which viable material recovery is no longer possible would be the rational choice considering their value cycle and the needs of the circular economy.

839 See COM (2017) 34 final, pp. 7–8.
841 De Römpf 2018b, p. 163.
6.3.3 Exclusion as an incentive

The wide interpretation given to the concept of waste is not suitable for all substances and objects that are discarded. Closing the loop and cascading the recovery of waste require incentives to go further than disposal operations and needs operators to choose waste-based materials over the virgin raw materials. Despite the shortcomings of the mechanisms of declassification as waste, the importance and potential of exclusions from the concept of waste are important drivers for more efficient waste management and treatment and the re-use of waste in production processes. Although the shortcomings of the regulation in terms of functionality have been recognised earlier in the conclusions, it is evident that the regulation on the exclusions from the concept of waste also does reduce barriers for using of waste-based materials and reaching circular economy. This chapter describes the way that application and reasonable interpretations of the key provisions of the dissertation can complement the circular economy objectives and remove barriers for utilisation of waste in accordance with the second research question of this study.

Both sets of criteria are supposed to ensure that materials can be excluded from the concept of waste without having any adverse environmental or human health impacts and can be used for the planned purpose. The rationale behind the legislation is that the additional monitoring and control mechanisms derived from the waste status are redundant and do not serve the purpose of protecting the environment but rather limit the potential recovery of the waste-based substances and objects. Where the waste status is redundant in terms of ensuring a high level of protection of the environment and of human health, and a purpose of use can be found for the waste material, exclusions from the concept of waste can have an important role in lightening the regulatory burden involved in using waste-based materials and thus promoting the use of waste-based substitutes instead of virgin raw materials. Nevertheless, it has to be taken into account that while in this situation legislation on waste ceases to apply, the material remains within the scope of the regulatory framework on similar products. It is possible that exclusion from the scope of waste legislation does not significantly lighten the regulatory burden in relation to the material and its use.

In addition to the by-product and EoW criteria, the extent of the new applicable legislation should be taken into account before drafting legislation on EoW or on by-product status. Use of the non-waste status is voluntary for producers and is only likely to be common in situation where the new legislative framework offers a simpler way to use waste-based materials. However, the concept of waste can apply to substances and objects that do not cause adverse impacts on the environment or on human health even when their use is regulated outside the scope of application of the waste legislation. For these kinds of waste streams, legislation on EoW and by-product status together with case-by-case decision-making can be tremendously beneficial in view of the functioning of the circular economy: substituting virgin raw materials with waste-based materials could be lucrative in both an economic and an environmental sense.

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842 Due to the precautionary principle.

843 Similar findings have been made in Levänen 2015a, pp. 46–52.

844 Considering REACH as well as production and product standards, it is possible that the regulatory burden post-waste status may be as big or even bigger.
Legislation on the declassification as waste for WtE makes sense if the point is to provide a level playing field between waste-based and virgin fuel products where such legislation is based on environmental and human health impacts instead of the origin of the fuel. However, these provisions should not function as incentives to bypass the need for better collection and separation mechanisms and the aim of complying with the waste hierarchy and achieving the circular economy. Linear recovery should only be used when there are no feasible material recovery alternatives.

Minimum environmental requirements are laid down in respect of the declassification of waste in the criterion of environmental acceptability contained in both by-product and EoW criteria. The criterion of environmental acceptability is the most important of all the criteria that cover declassification as waste, and provisions on this issue should always have neutral or positive impacts on the environment and on human health. This approach makes the regulatory scheme justifiable in the light of the precautionary principle of environmental law: the additional control measures laid down in waste legislation are no longer needed or are replaced by other provisions that assure a similar level of protection of the environment and of human health.

Achieving the objectives of waste policy as well as the circular economy involves walking a tightrope. Waste legislation is a mixture of environmental and economic objectives and finding common ground between the two can often be difficult. However, it is clear that regulation must be developed in such a way as to encourage operators to use waste-based materials, and ‘excess’ regulation that does not raise the level of factual protection should not be applied in relation to these substances and objects. When seeking to balance the two objectives, the environmental protection aspect should be prioritised over the objective of closing the loop where the two cannot be achieved at the same time. Legislation on declassification as waste usually has an enabling effect, while legislation on environmental and human health protection tends to be restrictive in effect. In addition, enabling provisions are built into those derived from environmental protection legislation. Finding a balance between the two objectives is crucial for the achievement of circular economy objectives.845

845 For further discussion on balancing EoW regulation and optimal solutions, see Turunen, 2017, pp. 186–207.
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The EU waste policy pursues the objective of harnessing waste efficiently back into the production processes in order to establish a circular economy. This dissertation focuses on the ways that the concept of waste and its exclusions, by-product and End-of-Waste status, can impact the achievement of the objectives of the circular economy in the Waste Directive. It analyses the possible interpretations of the legal concepts and the functioning logic of the regulatory system.