

End of Waste

Whitepaper

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INVESTNL



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Public summary

Increasing circularity requires improving recycling rates. Recycling reduces the need for virgin fossil raw materials and decreases the amount of waste that is incinerated or landfilled. However, waste may be contaminated and can pose safety risks to humans and the environment. Therefore, recyclers have to demonstrate that their recycling process turns waste into safe products. This requirement is laid down in the European Waste Framework Directive and the Dutch “Wet Milieubeheer”, which includes so-called End-of-Waste (EoW) criteria. If a recycled product complies with the criteria, the product receives the EoW status. This means that the recycled product is no longer waste and can be used as a product, in accordance with product legislation and regulation.

However, the current system of demonstrating that waste has been recycled into a safe product is difficult to navigate and the requirements for the EoW status are not clear. In addition to this, the EoW status is essentially self-declared. This means that it does not deliver the legal certainty sought by recyclers, potential customers, and investors. This lack of certainty results in delayed investments and customers demanding greater certainty before committing to buying the recycled products. Substantiating safe use and proving market demand is challenging. This results in circular companies being discouraged from developing and scaling up innovative solutions for a circular economy, which in turn delays the achievement of circularity goals.

Invest-NL and Groene Chemie, Nieuwe Economie (GCNE) aim to tackle these barriers and accelerate circular solutions at scale. They have commissioned this report to identify improvement opportunities. Relevant regulation has been reviewed and recyclers have been interviewed and surveyed. The main outcomes are divided into two parts:

- 1) actionable advice to recyclers on how to navigate the current system;
- 2) specific suggestions for policymakers to improve the system.

Navigating the current system (advice for recyclers)

It is your responsibility as a recycler to declare that your product ceases to be waste and complies with the EoW criteria. Your product shall:

- be used for a specific purpose in a single application;
- service a clear demand or access an existing market;
- comply with relevant (product) regulations and technical specifications;
- not lead to negative environmental or human health impacts.

To do so, you need to build a solid evidence base and bundle it in a dossier. In this report, you will find guidance on how you can do this (see chapter 3). Afterwards, it is an option to apply for an EoW ruling (“*einde-afval verklaring*”) at an “*Omgevingsdienst*”. However, the ruling itself does not give you legal certainty. The EoW status is essentially self-declared by the recycler.

Improving the current system (advice for policymakers)

There are good options for achieving swift improvements, especially around increasing the accessibility of the system and improving the recyclers’ knowledge of it. Realisable quick wins encompass:

- providing access to a single point of contact and centralising (recycling) expertise;
- raising awareness with recyclers (and investors) on the EoW criteria and that a self-declaration is sufficient;
- clarifying requirements around proving compliance with the EoW criteria, specifically around safe use for humans and the environment;
- developing good guidance and highlighting the applicability of product legislation.

Regulatory improvement can be:

- create legal certainty by allowing EoW ruling to be used as argumentation to support EoW claims;
- work on the European recognition of EoW rulings;
- develop specific EoW criteria. Focus on plastic and biobased waste streams;
- set-up and/or allow industry-led certification schemes in absence of EoW criteria or legal certainty. Such schemes can cover specific waste streams, recycling technologies and/or applications.

Ideally, these improvements are not limited to implementation in the Dutch context but are also taken forward on a European level. The Dutch government is encouraged to take a leading role in EU discussions on EoW with the aim to achieve uniformity and certainty within the EU internal market.

1. Introduction

1.1 Context and background

The European Commission and the Dutch government have set policy goals to increase recycling rates and move away from linear production systems. This movement towards developing circular systems puts increasing emphasis on recycling initiatives.

Recycling always starts with waste. Often, waste can be contaminated with substances that are hazardous to humans or the environment. The European Commission wants to prevent hazardous substances from ending up within recycled products and posing a safety risk when these products enter the market. Therefore, the European Commission has created End-of-Waste (EoW) criteria as part of the Waste Framework Directive (WFD). The criteria are designed to establish when a waste has been transformed into a safe product. Such a product should have a specific application and should be safe to use for that application. By adhering to the EoW criteria, the recycled product then obtains the so-called EoW status. However, there is substantial criticism from recyclers on the current (decentralised) implementation of the EoW system in the Netherlands.

In the Dutch implementation of the EoW system, a recycler is required to perform a self-assessment to prove that their product complies with the EoW criteria and self-declare their EoW status. However, within the Dutch implementation of EoW, it is also possible for recyclers to apply for an evaluation of the self-assessment from a local authority. Depending on the outcome of the evaluation, a EoW ruling may be issued for the product. This ruling should provide the recycler with additional certainty regarding their products compliance, however, often this is not the case. Furthermore, the system is seen as restrictive to new recycling initiatives, lacking in good guidance, and with much room for improvement.

1.2 Aim and scope of the report

Invest-NL and Groene Chemie Nieuwe Economie (GCNE) are actively engaging start-ups and scale-ups that develop novel recycling solutions. These recyclers indicate that they lack information on navigating the (Dutch) EoW system and find it difficult to comply.

Ecomatters was asked by Invest-NL and GCNE to write a report on the practical issues of the Dutch EoW system and highlight suggestions for improvement. This report covers the result of this work and it includes two workstreams:

- 1) Desk research activities to gain understanding of the (current) context, intention, and set-up of the current EoW system.
- 2) Gathering perspectives and experiences from recyclers on the EoW system and the opportunities they identify for improvement. This is done through in-depth interviews and a questionnaire.

The EoW system applies to all recycling processes and waste streams. The desk research, therefore, takes a broad view of this system. However, the suggestions for improvement will only cover a specific set of predetermined waste streams. These waste streams relate to the recyclers and recycling initiatives that Invest-NL and GCNE engage with. The recyclers that have been interviewed as part of this project are actively working on recycling initiatives that utilise these waste streams.

The waste streams within the scope are:

- biobased waste streams, consisting of:
 - municipal (sewage) water waste streams;
 - industrial (production) waste streams.
- mixed (heterogenous) post-consumer plastic waste streams.
- sorted (homogenous) plastic waste streams (PET, PE, etc.).

1.3 Reading guide

The report is structured in four separate parts, as highlighted in the visual below.



The report starts in Chapter 2 with an introduction to the regulatory context. Here we frame the context around the EoW system and discuss the relevant regulations on a European and Dutch national level. This is not an exhaustive overview and is instead primarily included to contextualise the perspectives provided by the recyclers on the current implementation.

In the next part of the report, Chapter 3, we detail the implementation of the EoW system itself. Here we expand on the EoW ruling and its limitations. We also provide clarity on how recyclers can navigate the system, including conducting the EoW (self-) assessment and demonstrating compliance with the EoW criteria. It was noted that there is a lack of information on what is required to conduct this assessment. As this is an integral part of proofing the EoW status, it was decided to structure this part in an informative manner. Beyond providing practical insights for (future) recyclers, this part helps to explain why recyclers are experiencing obstacles around gathering relevant proof.

We then summarise the outcomes of the interviews with recyclers in Chapter 4 to give a well-rounded overview of their experiences. This is supported by additional data obtained from the online questionnaire. Following this, in Chapter 5 we conclude by providing policymakers an overview of suggestions for improvements to the EoW system. We also present some additional takeaways that are specifically relevant for investors and recyclers in different stages of maturity.

1.4 Definitions

- **EoW (self-) assessment/ self-assessment:** The assessment and accompanying evidence base which declares that a recycled product is no longer a waste. The assessment is conducted by a recycling company and showcases adherence to the applicable EoW criteria.
- **EoW criteria:** EoW criteria as included in Article 6 of the Waste Framework Directive, are used to determine if a recycled product is no longer waste. Additional waste criteria exist for a limited number of waste types.
- **EoW dossier:** the full body of evidence detailing the outcome of the EoW (self-) assessment. Generally, it consists of a report and annexes with supporting evidence.
- **EoW ruling:** a statement made by a competent authority on the adherence to the EoW criteria for a recycled product based on the EoW (self-) assessment. Known in the Netherlands as the *“rechtsoordeel einde-afval”*.
- **EoW status:** the status that a recycled product (with a specific application) receives after the recycler can prove adherence to the EoW criteria. This status is self-declared and can optionally be checked by a public authority.
- **EoW system:** practical implementation of the EoW criteria, the self-assessment, the EoW status and the ruling.
- **Recycled product:** a product or intermediary product obtained through a recycling process using a waste as input feedstock. The product has a specific application and is made safe for human use and the environment in its intended application. Within the context of the REACH and CLP regulation, this is referred to as recycled substance.
- **Recycling process:** a process of treatment, recovery, and processing steps intended to create a product or intermediary product from a waste input feedstock.

- **Maturity:** maturity refers to the scale of the recycling installation that a company is trying to establish. The maturity ranges from start-up (pilots), to scale-up (demonstrators and pre-commercial recycling installations), to commercial scale. Commercial scale refers to a recycling plant that generates the desired production volumes to break even and is profitable under expected market conditions without further need for expansion, upgrades, or other adjustments.
- **Waste:** a material that is disposed of by the primary producer or user, and that needs waste processing and/or treatment as part of the waste handling.
- **Waste stream:** a waste material stream that can be used as feedstock for a recycling process.

2. Regulatory context



This chapter explains the regulatory context around the EoW system. In section 2.1 we detail the applicable European regulation and the relevant developments in this area. The section then continues with an overview of the relevant Dutch legislation and policy frameworks. Both sections contain several regulations and directives that are referred to throughout the rest of the report.

Please keep in mind that the EoW criteria expects compliance with the relevant product legislation. In this report, specific product regulations will not be explored as it was determined that there are too many different recycled products.

2.1 Regulatory context EU

Directive: Waste Framework Directive

The Waste Framework Directive 2008/98 (WFD) or in Dutch “*De Europese Kaderrichtlijn afvalstoffen*” sets the basic concepts and definitions related to waste management, including definitions of waste, recycling, and recovery. From an overall perspective, the directive requires waste to be managed under the following criteria:

- not endangering human health or harming the environment;
- without risk to water, air, soil, plants, or animals;
- without causing a nuisance through noise or odours;
- and without adversely affecting the countryside or areas of special interest.

The foundation of EU waste management is the “waste hierarchy” (see Figure 1), incorporated in the WFD (adapted from the Dutch ladder van Lansink). It establishes an order of preference for managing and disposing of waste. In general, loss of material after its service life should be prevented. Material origin (fossil-based or biobased) or degradability profile¹ does not alter this.

EoW in the WFD

The WFD defines when waste ceases to be waste and becomes a secondary raw material, and how to distinguish between waste and by-products.

EU regulations, directives, and action plans

- EU regulations is legislation that is directly legally in force throughout every Member State.
- EU Directives formulate certain goals or results, but each Member State is free to decide how to transpose directives into national laws, unless criteria are set through the “comitology”¹ procedure, which means the Member Status cannot implement them divergently in their national legislation.
- Policy frameworks lay down the future around a specific policy goal or topic, which can guide the development of new regulation and directives.

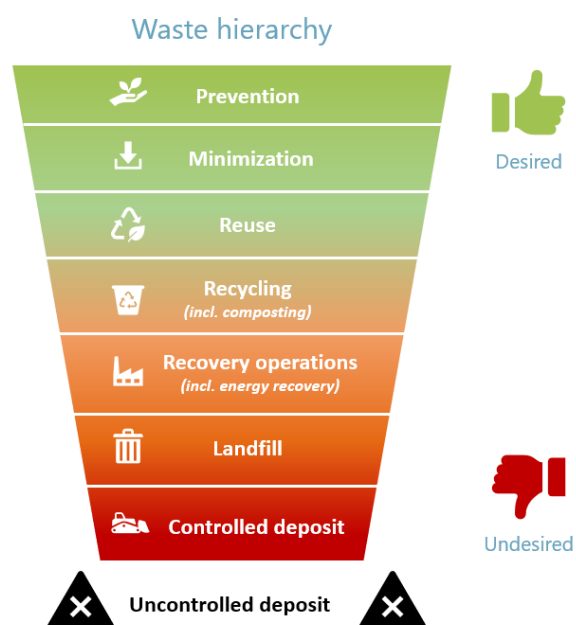


Figure 1 Waste hierarch from the WFD

¹ Biodegradability does not provide exemptions from the waste hierarchy.

According to Article 6 (1) of the Waste Framework Directive, certain specified waste ceases to be waste when it has undergone a recovery/recycling operation and complies with four specific EoW criteria, namely:

- 1) the substance or object is to be used² for specific purposes;
- 2) there is an existing market or demand for the substance or object;
- 3) the use is lawful (substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products);
- 4) the use will not lead to overall adverse environmental or human health impacts.

This criterion provides a high level of environmental protection while also ensuring economic benefit. The intention of adding the criteria is to further encourage recycling in the EU by creating legal certainty and a level playing field, as well as removing unnecessary administrative burdens³.

A mandate to set additional EoW criteria by EU Member States for specific waste streams was also introduced. The European Commission monitors their development and can create additional EoW criteria (if deemed necessary) through implementing acts⁴. Currently, the amount of waste stream specific EoW criteria is limited. In Europe there are only specific criteria available for metal scrap⁵, copper scrap and alloys⁶, and for glass gullet⁷.

A study was conducted by JRC to determine for which other waste streams new EU-wide criteria should be developed⁸. This highlighted that plastic and textile should be prioritised and that, at this moment, biobased waste streams should not be prioritised.

Afterwards the European Commission asked the JRC to develop specific criteria for plastics. It is expected that the JRC will deliver a technical assessment with the proposed criteria in Q1 of 2024. The criteria will then need to be adopted through a non-legislative implementing act. This work will likely build upon an existing technical proposal from 2014, which provides possible EoW criteria for waste plastic intended for conversion⁹.

Finally, Member States have implemented the WFD in their own national waste legislations. In response to the WFD, the “*Wet Milieubeheer*” (Dutch Environmental Management Act) was amended to incorporate the provisions on EoW.

Requirements for developing waste stream specific EoW criteria by Member States or the European Commission

Article 6 (2) from the WFD lists the following requirements for developing specific EoW criteria:

- 1) permissible waste input material for the recovery operation;
- 2) allowed treatment processes and techniques;
- 3) 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;
- 4) 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
- 5) a requirement for a statement of conformity.

By-product within scope of the WFD

A substance or material can also be designated as by-product (instead of a waste stream). The following definition is used in Article 5 of WFD:

² Post 2018 phrasing of criterion. From: Directive 2018/851 of 30 May 2018 amending Directive 2008/98 of 19 November 2008.

³ Adapted from: https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en

⁴ <https://eur-lex.europa.eu/EN/legal-content/glossary/implementing-acts.html>

⁵ Commission regulation No 333/2011

⁶ Commission regulation No 715/2013

⁷ Commission regulation No 1179/2012

⁸ https://environment.ec.europa.eu/news/commission-starts-develop-end-waste-criteria-plastic-waste-2022-04-05_en

⁹ <https://publications.jrc.ec.europa.eu/repository/handle/JRC91637>

“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”¹⁰.*

In addition to these conditions, there is further criteria for specific production residues. These can be used to test whether conditions b) or c) of WFD are met. In this way, more legal certainty is created for those involved in the trade in and use of the residue.

Researching by-products is not in the scope of this project and, as such, this document will not cover further topics or aspects related to by-products.

2023 WFD Revisions

Although legislation to reduce the amount of (municipal) waste is in place, the yearly amount of waste generated within the EU continues to increase. This has prompted a targeted revision of the WFD. The revision assesses the impact of the proposed changes WFD in line with the “Better Regulation” agenda. A stakeholder consultation was conducted for the revision. The outcomes of the associated Call for Evidence were published in January and February 2022, and the European Commission received just under 200 separate responses. Many of the respondents reflected on the need to address consumption and promote direct re-use and design for circularity in order to address waste prevention. Many respondents supported the concept that separate collection is a precondition for improving reuse and recycling, and several respondents highlighted the importance of separating packaging waste in this respect.

Several business associations mentioned the importance of Extended Producer Responsibility (EPR schemes). These systems have been around for a while and “EPR schemes on batteries, end-of-life vehicles, electric and electronic equipment, and packaging are implemented across the European Union. In the Netherlands, EPR also applies to car tyres, paper and cardboard, and flat glass. The Dutch government is also in the process of developing EPR policy for other product groups, including mattresses, textiles and some types of single-use plastics”. In most cases this will require government intervention or a strong public opinion push to materialise. However, secondary markets can instead be established when there is sufficient demand. Reuse of vehicle parts is a prime example of this.

Regulation: REACH

Registration, Evaluation, Authorisation, and restriction of Chemicals (REACH) is an EU regulation dating from December 2006. REACH¹¹ addresses the production (including recycling) and use of chemical substances, and their potential impacts on both human health and the environment. It is the strictest law to date regulating chemical substances affecting industries throughout the world.

One of the main requirements for demonstrating the EoW status of a recycled product is to show compliance with relevant regulations. Arguably, the most important set of requirements a recycler will have to show compliance with is REACH. REACH is therefore an important aspect of the EoW

¹⁰ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02008L0098-20180705&from=EN> (Article 5)

¹¹ Regulation 1907/2006/35

(self-) assessment and ruling.

Registration

Under REACH, companies are responsible for collecting information on the properties and uses of the substances they manufacture or import into the European single market that are greater than 1 ton per year. They must also assess the hazards and potential risks presented by the manufactured or imported substance.

This information then needs to be communicated to the European Chemical Agency (ECHA) in the form of a registration dossier containing the hazard information and, where relevant, an assessment of the risks that the use of the substance may pose and how these risks should be controlled.

Registration applies to substances on their own, substances in mixtures and, in certain cases, to substances in articles.

Registration is based on the *"one substance, one registration"* principle. This means that manufacturers and importers of the same substance must submit their registration jointly. The analytical information provided should be consistent and sufficient to confirm the substance identity. Depending on the type of material, appropriate analytical methods should be identified (such as GC-MS, LC-MS, UV-Vis, FTIR, etc). Resulting spectra, chromatograms, and other analytical outcomes need to be fully evaluated and interpreted within the joint registration. More information on the exact requirements for substance identification can be found in the ECHA guidance¹². Please keep in mind that polymers are exempt from registration and evaluation in REACH, but monomers and bound substances still need to be registered. This can also apply to certain biopolymers.¹³

Recyclers privileges under REACH

Under certain conditions, ECHA offers recyclers an exemption from the obligation to register substances obtained from recycling processes. This exemption is laid down in Article 2(7) of REACH. When the conditions are met by the recycler, they are exempt from registration and do not need to perform a chemical safety assessment or complete a chemical safety report of the recycled substance. As such, they are not required to:

- make an exposure scenario for the use of the recycled substance;
- register the recycled substance;
- notify ECHA on the use of the recycled substance.

The main conditions for exemption from registration are:

- recycling operations have taken place in the EU;
- the recycled substance is demonstrably the same as a registered substance;
- the availability of relevant information about the registered substance (for the preparation of a safety datasheet (SDS)¹⁴).

¹² https://echa.europa.eu/view-article/-/journal_content/title/guidance-for-identification-and-naming-of-substances-under-reach-and-clp

¹³ See page 40 and 45 in Biopolymers from a regulatory perspective, Ecomatters, 2021

¹⁴ <https://echa.europa.eu/support/practical-examples-of-exposure-scenarios>

SVHC screenings and communication requirements under REACH

Under Article 33 of REACH, it states that if you are an EU Article supplier (including a recycler) and your product contains Substance(s) of Very High Concern (SVHC) > 0.1% w/w, you must communicate information about this along the supply chain. As a minimum, the name of the SVHC has to be passed on. Although often considered challenging; for a recycler it is important that the recycled product is screened for SVHC. This screening is based on the composition and origin of the feedstock and, where necessary, supplemented with analytical testing.

The list containing the selected SVHC under REACH is called “*The candidate list for Substances of Very High Concern*”¹⁵. It is called “*candidate*” list because the SVHC are candidates for REACH Authorization and Restriction. A substance may be considered to be an SVHC if it meets one or more of the following criteria:

- it is carcinogenic;
- it is mutagenic;
- it is toxic for reproduction;
- it is persistent, bio accumulative and toxic (PBT substances);
- it is very persistent and very bio accumulative (vPvB substances);
- there is “*scientific evidence of probable serious effects to human health or the environment which give rise to an equivalent level of concern*”.

Screening for SVHC

A manufacturer/recycler can take the following steps in order to screen for SVHC:

- assessment of the product to determine if SVHC are intentionally added during production or if they are present in the used feedstock (i.e. flame retardants in electronics, or certain plasticizers in plastics);
- collect information on SVHC from (feedstock) suppliers to assess the fate of potential SVHC in the manufacturing/ or recycling process (are SVHC removed or destroyed?);
- When SVHC presence cannot be excluded based on value chain information, analytical screening for SVHC can be performed at a laboratory that offers SVHC testing as a specific service.

Substances on the SVHC list are identified on a case-by-case basis. Currently the list contains 233 entries of substances and substance groups. However, the SVHC list is not an exhaustive list and there are many more substances known with carcinogenic, reprotoxic, or mutagenic properties than present on this list. Although not covered under the specific communication requirements of Article 33 of REACH, hazard information on all constituents within the recycled substance or material needs to be collected and safe use information communicated via SDS (see next section).

Regulation: Classification & Labelling and SDS development

The Classification, Labelling and Packaging (CLP)¹⁶ regulation is a European Union regulation from 2008. It aligns the European Union system of classification, labelling, and packaging of chemical substances and mixtures with the Globally Harmonised System (GHS). It introduces classification criteria, European hazard symbols, and Risk and Safety Statements for labelling.

CLP requires all importers, manufacturers, and downstream users to classify, label, and package substances and mixtures adequately before they can be placed on the market.

A safety datasheet needs to be made available for all relevant parties conforming to REACH and CLP. This should provide all relevant information on operational conditions and risk management measures that ensure safe transport and use.

¹⁵ The candidate list can be accessed here: <https://echa.europa.eu/candidate-list-table>

¹⁶ Regulation 1272/2008

As specifically recommended by ECHA for recycled substances and formulations:

- The SDS for a recycled substance should be compiled in accordance with the text of Article 31 and Annex II of REACH. Where all appropriate guidance for safe use is set out in the main body of the document¹⁷.

Regulation: Shipments of waste (implementation of the Basel convention)

In 1992 the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal came into force. A response to public protests on the disposal of hazardous waste in developing countries, this worldwide convention signed by participating countries prohibits the disposal of hazardous waste to non-parties without the agreement of the receiving country. It also ensures that the receiving country can process the waste in an environmentally sound manner. Being able to demonstrate the EoW status of a recycled product may determine if your material is shipped under the requirements of the Basel Convention.

Within the EU the Basel Convention was implemented through the Shipment of Waste Regulation¹⁸. In the Netherlands, it is referred to as the “*Europese Verordening Overbrenging van Afvalstoffen*” or EVOA. In general, the rules of the EVOA are the same as in the Basel Convention in that they provide procedures and control regimes for waste shipments within the EU and to/from the EU.

When waste streams are imported or exported this regulation applies. It determines the procedures and control regimes for the shipment of waste, depending on:

- the origin and destination;
- the route of the shipment;
- the type of waste shipped;
- the type of treatment to be applied to the waste at its destination.

Furthermore, the Shipment of Waste Regulation contains an essential article related to the transport of recycled products across borders. According to Article 28:

“If the competent authorities of dispatch and of destination cannot agree on the classification as regards the distinction between waste and non-waste, the object or substance shall be treated as if it were waste for the purpose of the shipment”.

This means that any Member State decision made on a recycled product can be contested during transportation. This has ramifications for the EoW ruling (see Chapter 3).

In 2021 there was an update to the Shipment of Waste Regulation to incorporate new Basel Convention waste codes for the transport of plastic waste¹⁹. This means only homogenous plastic waste streams that are intended for recycling can still be sold internationally without prior notification on transboundary transport. Other plastic waste streams are still required to provide the notification²⁰. In the Netherlands, the Human Environment and Transport Inspectorate or “*Inspectie Leefomgeving en Transport*” (ILT) is responsible for deciding on submitted notifications on the transboundary transport of waste.

¹⁷ as recommended in Appendix 3. Specific issues relevant to the compilation of SDSs for recovered substances and mixtures of ECHA’s guidance: Guidance on the compilation of safety data sheets available via https://echa.europa.eu/documents/10162/2324906/sds_en.pdf/01c29e23-2cbe-49c0-aca7-72f22e101e20 and ECHA’s Guidance on waste and recovered substances available via https://echa.europa.eu/documents/10162/2324906/waste_recovered_en.pdf/657a2803-710c-472b-8922-f5c94642f836 (part of footnote on page 37)

¹⁸ Regulation 1013/2006

¹⁹ <https://www.ilent.nl/onderwerpen/afvaltransport-evoa/wijziging-classificatie-kunststofafval-per-1-januari-2021>

²⁰ For more information about the notification or “*kennisgeving*”: <https://regelhulpenvoorbedrijven.nl/afval/>

Policy framework: Circular Economy Action Plan

In 2019, the European Commission introduced the European Green Deal, a highly ambitious plan to redefine the EU as a thriving economy, redefining growth with positive social, environmental, and economic benefits. The overarching aim of the green deal is to make Europe the first climate-neutral continent while ensuring that no one is left behind in this transition.

One of the main building blocks of the EU Green Deal is the adoption (in March of 2020) of the new Circular Economy Action Plan (CEAP). The CEAP is considered a prerequisite to achieve the EU's climate neutrality targets and to halt biodiversity loss. The new action plan introduces initiatives along the full product life cycle. This includes targeting how products are designed, promoting circular economy processes, and encouraging sustainable consumption. It also aims to ensure that waste is prevented and that resources consumed are kept in the EU economy for as long as possible²¹.

Objectives

Measures that will be introduced under the new action plan aim to:

- make sustainable products the norm in the EU and empower consumers and public buyers;
- ensure less waste and make circularity work for people, regions, and cities;
- lead global efforts on circular economy.

They focus on the sectors that use most resources and where the potential for circularity is high, such as electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, food, water, and nutrients.

2.2 Dutch regulation

Regulation: Wet Milieubeheer

The term 'waste' is defined in the WFD and has been implemented in the Netherlands in the Environmental Management Act or "*Wet Milieubeheer*"²². No formal decision is required to turn a material into waste. The definition included in Article 1 of the regulation states: "*alle stoffen, preparaten of voorwerpen, waarvan de houder zich ontdoet, voornemens is zich te ontdoen of zich moet ontdoen*" (all substances, preparations, or objects which the holder discards, intends to discard or is required to discard). Based on this definition, a material can be either a waste or a product.

The question of whether a material is a waste or a product often arises during procedures in which a certain decision by a public authority is required. Consider, for example, the granting of an environmental permit. The holder – often a company – must be able to substantiate the status of the recycled material. This is in line with the responsibility of a producer who wants to market a product. The holder is primarily responsible for gathering the necessary evidence to substantiate the status of the material. In regards to the EoW, the "*Wet Milieubeheer*" incorporates the WFD criteria in Article 1(8).

To carry out this assessment accordingly, the Ministry of Infrastructure and Water Management (Ministry I&W) provides support to companies and competent authorities in various ways. For example, a helpdesk at Rijkswaterstaat²³. Here you can find a written explanation of terms such as waste, by-product, and EoW status, in the form of a guideline²⁴ that is regularly updated. Additionally, work is underway on drawing up national EoW criteria for specific materials as well as

²¹ Adapted from: https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en

²² <https://wetten.overheid.nl/BWBR0003245/2023-02-13>

²³ <https://www.afvalcirculair.nl/onderwerpen/linkportaal/helpdesk-afvalbeheer/>

²⁴ Leidraad 1.2 Afvalstof of Product; Richtsnoeren voor de uitleg en toepassing van de begrippen 'afvalstof', 'bijproduct' en 'einde-afvalstatus', Ministerie van Infrastructuur en Milieu, 2021

guidelines explaining the waste legislation and regulations in a specific case. The “Wet Milieubeheer” incorporates this provision from the WFD in Article 1 (9).

Policy framework: Landelijk Afval beheersplan 3 (LAP 3.0)

The National Waste Management Plan or “Landelijk afvalbeheerplan” (LAP3) describes Dutch waste policy. This will be followed up in the coming years by a Circular Materials Plan (CMP1).

The LAP consists of a policy framework and sector plans. The policy framework describes the objectives of the waste policy in the Netherlands and the policy for waste prevention and waste management. Topics covered are waste processing activities such as collection, recycling, incineration, landfill, and waste transport. Topics related to the transition toward a circular economy and the distinction between wastes and non-wastes are also part of the policy framework. Additionally, the ILT uses the LAP3 as an assessment framework for making decisions on submitted notifications on transboundary transport of waste.

Sector plans in LAP3

LAP3 also contains 85 sector plans²⁵. In the sector plans, more concrete policy has been laid down for various waste streams, for example for textiles, plastics, or oil-containing waste.

A minimum standard has been defined for each sector plan. These minimum standards ensure that waste is not processed at a lower tier of the waste hierarchy than desired. For example, if the minimum standard is recycling, then waste should not be incinerated as this is a lower tier than recycling.

The minimum standard is therefore an adaptation of the waste hierarchy (as established in the WFD) for separate categories of waste. The minimum standards form a reference level for granting permits for waste processing. In principle, permits are only granted if the requested activity reaches at least the minimum standard, i.e. if the activity causes an environmental pressure that is equal to or less than that of the minimum standard.

The following minimum standards are set for the waste streams that are covered in this report:

Sector plan 1 mixed-post consumer waste

- Separate into mono-streams for recycling. The left-over residue needs to be fit for incineration. The plastic waste falls under sector plan 11 after separation.

Sector plan 7 organic industrial waste

- Composting with the aim to recycle and digesting into biogas with the aim to recycle. This is the minimum standard for biobased waste streams from industrial settings.

Sector plan 11 Plastics and rubbers

- Mixed heterogeneous plastic waste and biobased plastic waste needs to be separated in thermoplastics, thermosets, and elastomers (for instance rubbers and silicon). Unless separating costs more than €205 per ton or is not possible due to waste composition (due to contamination) or technical issues. If a stream can't be separated, it can instead be used as a fuel for energy recovery.
- Thermoplastics should be recycled as a minimum. Thermoplastics, thermosets, and bioplastics should get a useful purpose, which may include the use as a fuel for energy recovery.
- Biodegradable bioplastics are excluded from this sector plan. Composting has its challenges and it does not necessarily degrade properly in the environment. The Dutch government is still developing a policy position on biodegradability. Therefore, biodegradable bioplastic is

²⁵ <https://lap3.nl/sectorplannen/sectorplannen-1-85/>

currently covered under sector plan 1 for mixed post-consumer waste, which follows the minimum standards for handling this type of waste (sorting and then burning what can't be recycled).

Sector plan 16 Water treatment sludge

- The sludge can be used for material recovery (phosphate, bioplastic, alginate, etc.), but the residual materials can't be landfilled. Other options for sludge are thermic treatment (burning and gasification) or use as an additive in hydrostab²⁶.

The sector plans show that recycling is envisioned as part of the minimum standard for the waste streams considered in this report. Additionally, from the perspective of determining adherence to the EoW criteria, it is expected that the recycling process does not perform worse in terms of human health and environmental impact when compared to the minimum standard detailed in the sector plans.

Circular Materials Plan

The CMP1 is scheduled to replace the LAP3 by 2025. This update intends to go beyond the policy framework included in LAP3 and increasingly incorporate circular economy topics. The aim is to move up the waste hierarchy and nudge companies towards:

- prevention and re-use;
- recycling instead of energy recovery.

The government intends to conduct an environmental impact study or "*milieu effect rapportage*" (m.e.r.) for the CMP1. There are several policy decisions that still need to be made by the Dutch Government. These decisions will be covered by mandatory consultation, which is part of the m.e.r.-procedure. Depending on the position taken by the government, this can lead to changes to minimum standards. It can also alter the way the SVHC are handled when recycling plastic or biobased waste streams.

Policy framework: Nationaal Programma Circulaire Economie 2023-2030

The national program on circular economy or "*Nationaal Programma Circulaire Economie*" is a comprehensive plan from Ministry I&W to make policy goals around circularity more compelling. A range of policy measures is proposed to add detail to the government's ambitions for 2030 and 2050. These measures are geared toward the input side of the circular economy. The national program considers improving waste separation, design for re-use, and reducing virgin material use. Pricing mechanisms are also considered on the demand side. This can result in the development of new EPR systems or lead to the implementation of CO₂ pricing for the use of virgin materials. CO₂ pricing is currently under consideration for the use of fossil-based plastics, with a decision expected in 2023. However, most measures require further exploration before they can be successfully implemented.

Even though EoW is not mentioned in the national program, much of the recommended measures will result in increasing the amount of material available for recycling. For example, one measure is specifically aimed at standardising the separation of waste streams, and another sees the minimum standards in the sector plans increase. Of note is that for plastics, the focus will be on higher quality mechanical recycling instead of chemical recycling, primarily as this has a lower environmental impact.

Finally, the government takes the position that the minimum standards should also be applied in other Member States when it comes to waste transport. The idea is that this increases the

²⁶ Hydrostab is used for sealing in landfilling sites.

availability of high-quality waste streams suitable for recycling. It should therefore be included in the revision of the EVOA.

3. Implementation EoW system



This chapter describes how the EoW criteria has been implemented in practice. It also describes how the EoW status can be claimed and how that relates to the EoW ruling.

Figure 2 provides a high-level overview of current implementation of the EoW system, and it outlines the interrelation between the (different) EoW criteria, the self-assessment, the ruling, and the EoW status. As shown in the figure, the EoW status can be claimed through self-declaring compliance to the EoW criteria, supported by the conducted EoW (self-)assessment. The EoW ruling is an optional evaluation of the EoW (self-)assessment. Therefore, the ruling is not a prerequisite for proving adherence to the EoW criteria.

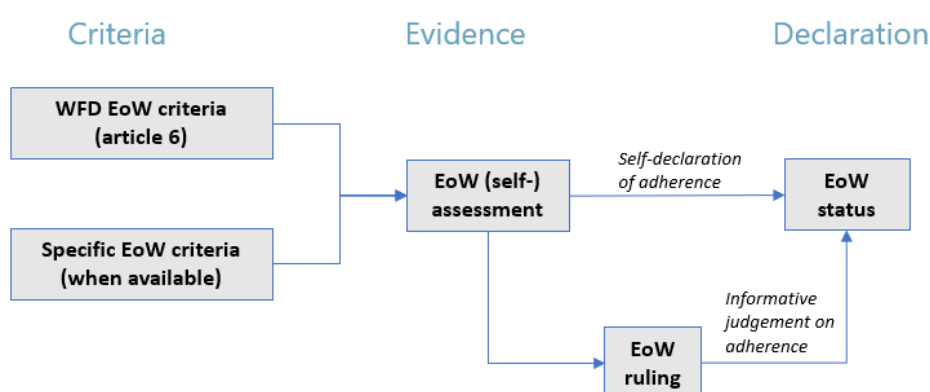


Figure 2 The EoW system, consisting of the EoW criteria, the self-assessment, the ruling and declaring the EoW status

The first part of this chapter (section 3.1) specifically covers the EoW ruling. We will talk about the legal status of the ruling and how it can be obtained. We will also briefly discuss which specific EoW criteria are available, beyond the four criteria from the WFD.

In the second part of this chapter, we will discuss how to conduct the EoW self-assessment (section 3.2). This assessment is used by a recycler to prove that the recycled product adheres to the EoW criteria, and thus has reached the EoW status. We will first discuss how to structure the assessment and then delve into each of the criteria, describing what can be considered for each of them.

3.1 The EoW ruling

What is the EoW ruling

In the Netherlands it is possible to ask an authority to evaluate the self-assessment²⁷. A “rechtsoordeel einde-afval” (EoW ruling) is issued when the authority has evaluated the case and is positive that the EoW status has been reached. The evaluation is completed using the same four EoW criteria as the WFD. Additional waste stream specific EoW criteria is also used when available (see WFD in section 2.1). As mentioned previously, the European EoW criteria covers only metal scrap, copper scrap and alloys, and glass cullet. In the Netherlands criteria are only available for recycling granulates from construction demolition waste²⁸. Therefore, no criteria exist for either

²⁷ Most other Member States have implemented their own processes to provide case-by-case decisions on the adherence to the EoW criteria. See for a full overview page 25-26 of Study to assess Member States practices on by-product and End-of-Waste, Umweltbundesamt GmbH and Arcadis, 2020

²⁸ <https://zoek.officielebekendmakingen.nl/stcrt-2015-3498.html>

biobased material or recycled plastic waste. This means that, in practice, the four EoW criteria of the WFD are the only criteria used for the evaluation.

In order to complete the evaluation, the authority looks at evidence provided by the recycler. The recycler needs to be able to prove they adhere to the EoW criteria before the authority can reach a positive decision and issue a ruling. The authority will also seek to understand what protocols, procedures, and/or management systems are in place to safeguard future compliance.

Legal status of the EoW ruling

The formal nature of the EoW ruling suggests that the document provides legal certainties. This is not the case. The EoW ruling has an informative character²⁹. The ruling is an acknowledgement of adherence to the criteria by the recycler. The sole purpose of the document is so that the recycler can use the EoW ruling as evidence for other decision-making processes. For instance, when applying for an environmental permit for a recycling plant.

A publicly available ruling explicitly states the extent of its legal certainty in the following manner:

- *“Dit rechtsoordeel is geen besluit in de zin van de Algemene wet bestuursrecht. Het heeft een informatief karakter en kan als zodanig door u worden ingebracht bij beoordelingen en beschikkingen door het bestuursorgaan dat bevoegd gezag is ten aanzien van uw activiteiten”*³⁰. (Freely translated as: This legal judgment is not a decision applicable to a range of cases as within the meaning of the General Administrative Law Act. It has an informative character and as such this ruling can be submitted as supporting documentation to public authorities for assessment and decision making in regards to your activities.

Furthermore, it also highlights that EVOA is still applicable. When the recycled product is transported outside of the Netherlands, the recycled product remains a waste if the receiving country declares it to be so. There can be different opinions on whether a recycled product is considered waste by the exporting and the receiving country. In that situation Article 28 from the EVOA³¹ determines that the transported substances are by default considered a waste.

From the statements included within the ruling document, it is clear that an EoW ruling offers no legal certainty. Obtaining a ruling is therefore entirely optional. However, despite this, many recyclers still want a ruling in order to strengthen their argument that EoW status has been reached. It can also be used as supporting evidence when dealing with public authorities within the Netherlands.

The process of obtaining a ruling

In the past Rijkswaterstaat (RWS) handled the applications for rulings. RWS is the executive agency of the Ministry of Infrastructure and Water Management (Min. I&W). Currently the *“Omgevingsdiensten”* (decentralised environmental service agencies) are tasked with conducting the evaluation and issuing the ruling. A ruling can only be requested from the agency in the region that you are located in³². This is either your main Dutch office or where the recycling plant is (to be) sited. In most cases the process starts with informally engaging with the agency about the recycled product before submitting a formal application.

²⁹ Please keep in mind that for waste streams with specific EoW criteria it is possible that a statement of compliance with these criteria is required. In those cases, the EoW ruling can potentially provide additional legal certainties, but this has not been explored.

³⁰ *“Rechtsoordeel einde-afval Tacoil als grondstof voor kunststofproductie”*, Ministry of Infrastructure and Water Management, 2020

³¹ Regulation 1013/2006

³² A full list of *“Omgevingsdiensten”* in the Netherlands can be found here: <https://www.omgevingsdienst.nl/omgevingsdiensten/>

3.2 Conducting the EoW (self-) assessment and compiling an EoW dossier

In the self-assessment the recycler organises the relevant data and required proof in an accessible manner. In most cases this is a dossier consisting of a (summary) report and supporting documents (i.e. laboratory reports, contracts, studies, etc.). The dossier supports the claim that the recycled product is safe for human use and for the environment in its intended application or use. After finishing the assessment, a self-declaration on reaching the EoW status can be made or a ruling can be sought.

In the upcoming section we will discuss how the assessment can be conducted. To do so, we will explore each of the four criteria in more depth. Figure 3 outlines the components of the EoW (self-) assessment covered in this chapter. Understanding this will enable you to develop a dossier and report encompassing the relevant evidence. However, it is important to note that the created dossier is not static. Instead, the dossier should be updated when material changes arise, for instance around feedstock sourcing, treatment, intended application, procedures, or management systems, etc.

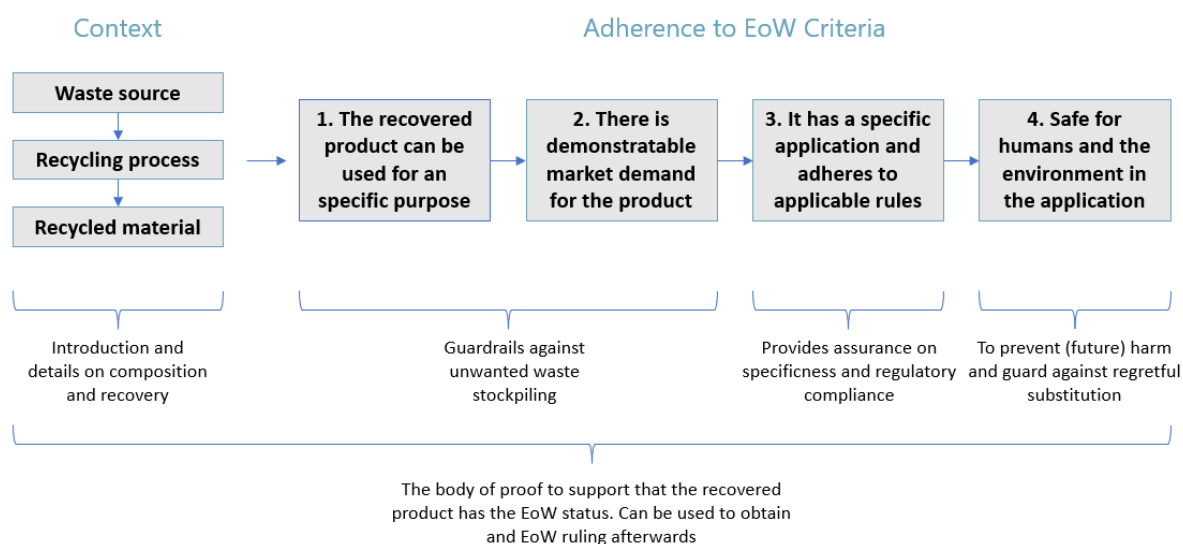


Figure 3 The EoW (self-) assessment

3.2 Providing context on the recycling process

The waste source, recycling process, and the recycled product

Prior to discussing the four EoW criteria, it is important to provide an introduction to the recycling process and the resulting product. This should cover details of the waste source, sourcing of the feedstock, the recycling process, and the final product. When doing this, be sure to provide a clear narrative on the recycling process. This serves two purposes, namely:

1. to describe your recycling process in detail for third-parties (including relevant process steps and procedures before, during and after treatment);
2. to detail the (chemical) composition of the waste and recycled product.

In regards to the source material, you need to showcase that control is exercised over the specifications of the waste. This means detailing the sourcing strategy and pre-treatment steps that are required. This part should cover how the waste is created, what the waste composition is (including European Waste Classification³³ codes), and detail any impurities in the feedstock. In

³³ Guidance on classification of waste according to EWC-Stat categories, Eurostat, 2010

regards to the impurities it is important to demonstrate how these are controlled during the recycling process. Doing so shows how you deal with the potential hazard's due to changes in composition. Furthermore, analytical data on the composition of the input material should be available to support statements made on the composition of the waste. If non-waste materials are mixed with the feedstock these should also be covered.

It is also necessary to accurately explain the waste sourcing strategy. This includes detailing where the waste is obtained from, either an established sources or a fluctuating supply base. It should also be clearly stated what your decision criteria for waste acceptance and rejection. This includes procedures and protocols regarding inspection, testing, and the rejection of incoming waste feedstock batches. Be sure to also provide evidence of the contractual provisions and control mechanisms you use. This proves that you only take in waste material that can be handled by your recycling process. Expand this evidence base with details of the enforcement system (in case of contractual breaches), audits procedure(s) and audit trails, and the compliance history. It is highly recommended to visit suppliers to make sure they understand the contractual conditions and adhere to them.

When describing the recycling process, it is important to cover the recovery flow and the individual process and treatment steps. Detail any steps that require specific equipment and describe their role. Include a mass balance for the complete recycling process. If additives or non-waste materials are added, you should detail this too (including their composition and specifications).

After explaining the feedstock and the recycling process, it is time to discuss the product itself. First, highlight its intended application. Make sure to be clear and specific, as this will be important for proving that the recycled product meets the EoW criteria. When considering multiple applications, it is advisable to make sure to cover each application separately and that the criteria are met for each individual application.

The chemical composition and physical chemical properties (i.e. density, flammability, etc.) of the recycled product need to be provided. The details of the composition must be supported by analytical tests and the standards (EN, NEN, ISO, ASTM, PAS, etc.) used to conduct the test(s) included. It is important to also cover the sampling plan that is used to establish the bandwidth of variance in regards to the composition. If there are deviations from the expected bandwidth it should be clearly highlighted.

In regards to the analytical test itself, be sure to describe the test methods, detection limits, and variability (including variation over time). Furthermore, provide information on the laboratory that has conducted the test and mention their (relevant) certifications. It is not obligatory to perform the tests under Good Laboratory Practice (GLP) rules, therefore in-house test results are allowed for demonstrating the composition and other relevant properties of the substance or material.

Finally, add any other relevant requirements related to the application. These requirements can be either widely followed standards in the market or specific customer requirements.

3.3 Criterion 1

The substance or object is to be used for specific purposes

The first criterion aims to establish that the recycled product has a practical use. The intention is to demonstrate that your recycling process is not a form of hidden waste disposal or stockpiling. This means proving that your recycling process establishes a new recycling pathway or that the recycled product replaces a product made of virgin materials. Here, the information included in the introduction of your assessment can be used to support your argument.

In the case of your recycling process does replace a virgin product, include details of the standards and requirements of the virgin product. These should align closely or overlap with the standards you

have included in the introduction. Doing this will allow you to establish that recycling leads to the production of product that can access (and stay on) the market.

It is also important to provide evidence that there is no (long-term) stockpiling taking place. Detail the policies you have enacted to prevent stockpiling in order to prove that your recycling plant is not used for unwanted forms of waste disposal or storage.

3.4 Criterion 2

There is an existing market or demand for the substance or object

The second criterion is designed to show that the recycling process has a lasting place in the market. Therefore, you should be clear how big the market for your recycled product is and how your market will develop. Be sure to describe relevant (long-term) trends and risks. This will provide perspective on the changes in demand that can be reasonably expected. Include specific drivers for change such as:

- regulatory changes and expected policy shifts;
- changing user patterns;
- technological developments;
- etc.

Furthermore, explain how these changes can impact your ability to sell your recycled product. Make sure to do this without undercutting your arguments on why your product remains a valid option in the market. Use your existing market research as supporting evidence.

Be sure to also cover details of the demand for competing virgin product(s). Include how demand for competing virgin product(s) is expected to develop, especially if these products have been included under criterion 1. Additionally, consider including the sales price of the recycled product and your competitors. Your narrative should be supported with evidence of actual demand. The best evidence is an existing sales history (invoices, PO-orders, offtake agreements, contracts, etc.).

When there is no sales record or negotiations are still ongoing, other evidence can be used instead. This can be “*Expressions of Interest*” or “*Declarations of Intent*”. When using this type of evidence, make sure to update the information with more solid proof when it becomes available. Furthermore, make sure that the evidence base around market developments and demand aligns with the intended application of the recycled product.

Finally, in the case of an intermediate product, the narrative around market demand extends beyond your direct customer. Here, you should also describe the demand from the end-users. This is likely to require gathering additional evidence from customers or by conducting market research.

3.5 Criterion 3

The recycled product is used for a specific application and adheres to relevant legislation

In this section of the assessment, you cover which regulations apply to your recycled product. The application of your product is central to determining which product legislation you must adhere to. Make a list of all relevant regulations and how your product complies with each regulatory requirement. Where possible, provide evidence that support your claims.

For most, if not all, recycled substances and materials REACH will apply. This is regardless of the potential recyclers privileges stated in REACH Article 2(7). Exemption from the registration requirement may apply. As mentioned in Chapter 2, this exemption only applies if the substance is already registered and it is possible to prove that your substance is identical.

It is important to make sure to carefully check if an exposure scenario for the intended application is available in the existing REACH registration. This exposure scenario needs to be identical to the intended application of your recycled product. Beyond registration, the regulation also dictates that producers need to inform their customers about the presence of any SVHC in their products (exceeding 0.1% by weight) and provide instructions on safe use of the product. This also applies to the CLP³⁴, which requires hazard communication, for example, in the form of the EU (extended) Safety Data Sheet (SDS) for the substance.

3.6 Criterion 4

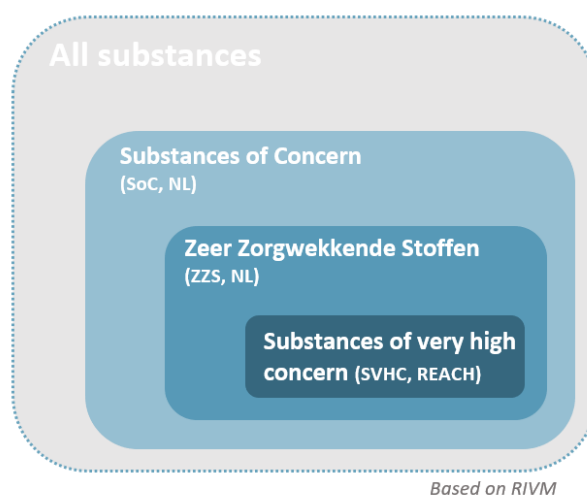
The application does not lead to overall adverse environmental or human health impacts

As a recycler it is your responsibility to demonstrate that the waste feedstock can be recycled in such a way that there are no adverse effects to humans and the environment. Demonstrating safe use means that data is available on the hazards of producing the recycled product and exposure levels during the life cycle of the product. Ensuring that there will be no overall adverse impacts on human health and the environment is fundamentally important.

The chemical safety assessment for EoW starts with the waste input materials. Authorities show specific interest in the (potential) presence of Substances of Concern (SoC). Figure 4 outlines how these relate to previously discussed SHVC. It is likely that waste streams are contaminated with certain hazardous chemicals. Examples include pharmaceutical residues in sludges, flame retardants (now restricted), or plasticisers in polymers that can migrate into the recycled materials.

In order to demonstrate safe use, it is necessary that potential contaminants are identified in the waste stream. It is also necessary to show that the waste has been treated to remove all waste-related risks and will not cause overall adverse impacts.

Regarding manufacturing and use, you need to consider if compliance to substance or product legislation



Based on RIVM

Figure 4 SoC, ZZS and SVHC

SoC and SVHC lists

Substance of Concern (“Zeer Zorgwekkende Stoffen (ZZS)”) are identified using the exact same criteria as the SVHC from REACH. In the Netherlands this is part of the “Wet Milieubeheer”. Although a substance on the SoC list is identified in the same manner as SVHC, the identified number of SoC’s by RIVM is approximately 2.100 (compared to 233 SVHC under REACH). All REACH SVHC substances are also listed on the Dutch SoC list which RIVM update twice a year.

In addition to SoC (ZZS), the RIVM also maintains a list of Potential SoCs (pZZS). This list contains substances that may potentially meet the hazard criteria but have not yet been listed as a SoC. The most common reason for this is a lack of suitable toxicity data (or evaluation thereof) demonstrating the presence or absence of the hazard profile of concern. This list contains approximately 600 substances and is also updated twice a year.

In regards to the SVHC list, new SVHC candidates are proposed by Member States or ECHA itself. Adding a substance to the list is a lengthy (and sometimes political) process that can take several years. As the basic (hazard based) selection criteria are identical, it may be that currently listed SoCs are added to the REACH SVHC list in the future.

³⁴ Regulation No 1272/2008

is sufficient to exclude any adverse environmental or human health effects. In some cases, demonstratable compliance to REACH and application specific regulations (such as for cosmetics, or food contact materials³⁵) may provide adequate data to demonstrate safe use.

When there is no clear guidance available from product regulation, you need to perform a structured chemical safety assessment. Such assessment generally contains the following elements:

- Inventorisation of hazards (in alignment with CLP) such as;
 - (acute) toxicity;
 - skin/eye irritation;
 - potential effect on reproduction;
 - aquatic toxicity;
 - bioaccumulation potential;
 - etc.
- Establishment of limit values (if available)³⁶ such as:
 - derived no effect levels (DNELs);
 - predicted no effect levels (PNECs).
- A systematic overview of intended uses:
 - industrial, professional, or consumer use;
 - operational conditions;
 - indoor or outdoor use;
 - etc.
- Exposure assessment:
 - what types of exposure may occur (skin, oral, inhalation);
 - potential releases to water, soil, or air;
 - quantification/qualification of exposure.
- Final fate of the products:
 - incineration, landfill, or recycling.
- Evaluation if expected emissions or exposures may lead to adverse effect.

The chemical safety assessment can be performed by a Quality, Health, Safety & Environment (QHSE) specialist or other (occupational) health and safety specialist. Where necessary, internal specialists can be supported by external chemical safety specialists, such as toxicologists.

Figure 5 gives a schematic overview of the process of completing a chemical safety assessment. More specific guidance on this topic can be taken from the REACH framework and accompanying guidance's.

Examples are:

- *"Guidance on Information Requirements and Chemical Safety Assessment"*³⁷
- *"How to prepare a downstream user chemical safety report"*³⁸

³⁵ Note that not for all Food contact materials (FCM) harmonised EU regulation exists. Among other, for plastics (regulation 10/2011) this is the case. However, no EU harmonised set of rules are implemented for -for example- rubber, paper, and coating FCM. In contrast to the implementation of the EoW requirements, for FCM a system of mutual recognition is established between EU member states. In practice, the Dutch or German FCM requirements are considered authoritative throughout the EU for FCM for which no harmonised EU rules exists.

³⁶ Limit values for registered substances under REACH are often available via their disseminated registration dossier. A full chemical safety report containing relevant exposure scenario's may be available after registration.

³⁷ <https://echa.europa.eu/en/guidance-documents/guidance-on-information-requirements-and-chemical-safety-assessment>

³⁸ https://echa.europa.eu/documents/10162/17250/pg17_du_csr_final_en.pdf/03aeab25-405a-45a4-9a66-5fa5c2dbfcb2?t=1442827454496

- “How to undertake a qualitative human health assessment and document it in a chemical safety report. Practical Guide 15”³⁹

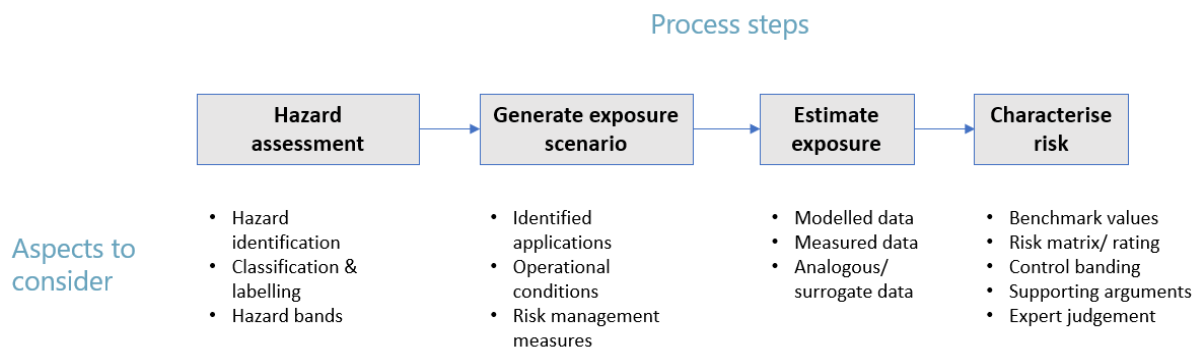


Figure 5 Schematic overview of process step to follow for a chemical safety assessment

³⁹ https://echa.europa.eu/documents/10162/13655/pg_15_qualitative-human_health_assessment_documenting_en.pdf/26a645d4-a81e-4223-8ca9-20162ae74e72

4. Recycler perspectives



Eight recyclers have been interviewed to understand their experiences with EoW and derive learnings for improvement. This chapter aggregates and summarises the recycler experiences as they have been shared during the interviews.

Note: A diverse range of opinions were shared during the interviews. Not all of these are relevant to a wider audience. Therefore, a summary of the most notable findings has been included in this chapter. The order in which experiences are presented is not related to their relative importance, but instead are the result of the authors' attempt to organise and add structure to the data.

Section 4.1 of this chapter describes the interview setup. Section 4.2 details the interviewees' experiences on working with EoW criteria (including their interpretation) and using the criteria for conducting the self-assessment. The most notable insights will be discussed for each criterion separately. Then, section 4.3 covers the recyclers experiences with applying for an EoW ruling and section 4.4. presents solutions as suggested by interviewees. These solutions focus on taking away barriers and improving the overall process. Finally, section 4.5 covers some of the key take aways from the survey questionnaire. This survey was ran to expand upon the insights gathered in the interviews (see Annex I for full details on the survey).

4.1 Interview set-up

The 8 interviews were conducted in a semi-structured format using a predefined sets of questions around four focus areas. At the same time, a free flow of the conversation was encouraged to gain in-depth information about which elements were most relevant for the organisation being interviewed.

The four interview focus areas were:

- 1) insight into the organisation's recycling case;
- 2) status of the self-assessment;
- 3) applying for a ruling;
- 4) potential improvements.

The organisations were selected and invited in close consultation with Invest-NL and GCNE. During the selection process diversity was ensured where possible by considering variation across the following aspects:

- input waste streams used (mixed heterogeneous plastic, homogeneous plastics, and biomaterials);
- maturity (from start-up to commercial scale);
- progress with and understanding of EoW (from exploratory to experienced).

The organisations that have been interviewed are: AquaMinerals, Clariter, Paques Biomaterials, PreZero, Umincorp, Renewi, SusPhos, and, Torwash.

4.2 Experiences around the EoW (self-) assessment

A key part of the interview was to gather insight into the recent experiences that the interviewee had with completing the assessment and hear any observations they made on the assessment process. The aim was to understand how they experienced the data gathering process, the clarity of

the requirements, and the access to relevant guidance documents. The main feedback provided is summarised below.

General information availability and accessibility

- All interviewees acknowledged the importance of EoW (self-) assessment in the transition to a circular economy and perceived the topic as (highly) relevant for their organisation.
- One of the first steps for recyclers is to find information about the criteria that they need to comply with and understand how they can prove compliance with evidence. However, interviewees often also communicated that information about the EoW (as implemented in the Dutch context) was either not available or not easy to find in an accessible format.
- Some interviewees, more often those at the start of the self-assessment, were not familiar with the EoW criteria and did not have a clear picture on how to conduct an EoW assessment due to a lack of guidance.

Perspectives on criterion 1: Specific purpose

- It was noted that there will be less questions from customers and investors around EoW and the existence of an EoW ruling if the recycled product is easily perceived as a product. This is for instance the case when another recycled product with the same composition is already widely sold. However, in many cases, there are a range of purposes that recycled products can be used for. This makes it less straightforward. When dealing with a multi-purpose product, there more emphasis was put on the availability of an EoW ruling.
- It was indicated that having no EoW ruling was less of an issue when safety, health, and/or environmental risks and hazards are known to play a part in producing and using a virgin alternative. There is a greater awareness of the risk management requirements and process controls needed when there are more safety concerns around the virgin product. Customers and investors therefore deemed the risk associated with recycling less of a concern as the existing tight control regime around the virgin product would automatically force a recycler to adhere to these standards too. This also meant that there would be a strong focus from the customer on understanding the composition of the recycled product.

Perspectives on criterion 2: Proving market demand

- A recycler can experience a deadlock with investors or customers, and public authorities, when it comes to proving market demand. The authorities require the recycler to prove market demand for the product which can often only be demonstrated with contractual commitments from investors or customers. However, as these commitments will only be made after an EoW ruling is provided by the recycler, the requirement leads to a stalling cycle of dependencies and inaction.
- The transition from start-up, to scale-up, to commercial scale, is a continuous process. It is therefore unclear for starting companies at which point of maturity the EoW ruling needs to be obtained as proving market demand can be difficult.
- Interviewees also experienced that it can be challenging to get demonstrators off the ground due to the focus on needing an EoW ruling. Demonstrators are crucial to the exploration of new recycling processes and product application opportunities at pre-commercial scale. Interviewees argue that establishing small scale demonstrators should be better facilitated by getting a provisional exemption from (part of) EoW criteria. The argument is that these activities take place in a controlled environment and recycled products do not yet end up on the market. This is particularly relevant when potential customer needs to be involved early

in the development process. For example, to test the recycled product for a certain application. The absence of an EoW ruling can be a hinderance to engaging the customer.

Perspectives on criterion 3: Proving lawful use for its intended application

- Interviewees communicated that an obligation to do a separate self-assessment for each application is difficult, especially for recycled intermediate products as the spectrum of applications can be very broad. Additionally, if the recycled product is traded as a commodity, the potential applications are not under the control of the recycler. This makes choosing a specific application for the self-assessment ambiguous and limits marketability of the recycled product.
- Some of the interviewees communicate that EoW criteria are unclear or unavailable for a specific product and application. For these cases, they might instead rely on requirements from regulations (that is applicable for the intended application) to prove lawful use during the self-assessment. This approach is in line with the expectations of the EoW system, but only works for recyclers that are focussed on a specific application for which product legislation exists.
- Multiple interviewees communicated difficulty with determining where the switch from waste to product is to be made. For example, a feedstock might undergo a series of recovery steps, while further pre-treatment is still required for the next phase of production. As not all these steps have to occur at the recycler, it raises the question of exactly when does the waste becomes a product. This especially is an issue when considering intermediate products which require additional manufacturing steps before the final product reaches the market.

Perspectives on criterion 4: Environmental & health impacts

- The interviewees communicated across the board that the safe use of the recycled product was considered important and requires solid substantiation on the part of the recycler. At the same time, the interviewees couldn't always make explicit how safe use was guaranteed. However, generally more specific information on safe use was available when time had been invested in regulatory compliance. Additionally, companies that have already put more effort into setting up process controls to safeguard product safety are less concerned about what EoW entails for their business.
- Some interviewees were aware of the tiered modular framework developed by the "Rijksinstituut voor Volksgezondheid en Milieu" (RIVM): Creating Safe and Sustainable Material Loops in a Circular Economy⁴⁰ for proving safety for humans and the environment. This framework was however perceived as generic and difficult to interpret and implement. Additionally, it was communicated that there is a need for a more tailored guidance on how to comply with the EoW criterion on environmental health and safety, such as threshold values for Substance of Very High Concern (SVHC)'s depending on applications.
- Interviewees mention that the list of "zeer zorgwekkende stoffen (ZS)" and substance limit values included in the annexes of the previously mentioned RIVM framework, used by "Omgevingsdiensten" when handling EoW ruling applications, is too conservative in safety requirements for recycling processes. According to some, this might create an unfair playing field. Safety concerns are more stringently applied for products produced from waste compared to products produced from virgin feedstock. This creates the perception of unfairness as a virgin feedstock is not necessarily free of hazards.

⁴⁰ Creating Safe and Sustainable Material Loops in a Circular Economy, RIVM, 2018

- The RIVM framework is also argued to be potentially stricter than frameworks used in other Member States. This makes it harder to obtain EoW status in the Netherlands than in other countries. Note: the RIVM framework takes a conservative stance when it comes to recycling. Newly adopted regulation can prohibit the use of certain substances in products that are produced after adoption. However, these restrictions have not been applied to historically produced products. Consequently, the legacy substances still circulate in society and can find their way in to recycling processes. In addition, the RIVM framework states that regulations may be missing, such as those for controlling drug residues, which can impact recycling processes if adopted (specifically when it comes to using municipal waste treatment feedstocks).

Differences between organisations

The interviews provide insight into how recyclers deal differently with EoW. Some of the more noteworthy differences are:

- Company maturity and previous exposure to EoW criteria (incl. assessment and the ruling process) determines the extent of understanding across interviewees. Early-stage companies could only match this experience if time is invested in exploring the criteria and building up a dossier.
- Organisations doing thorough analysis and testing on chemical composition (incl. purity levels), SVHC presence, and other quality checks on feedstocks and recycled products, find EoW less challenging. While these activities might be an integral part of complying with EoW criteria, they are often carried out for other reasons and simply perceived as part of what is required to operate a recycling company.
- Organisations with fluctuations in feedstock purity, and especially their pollution grade, experience more difficulty with the self-assessment. This is partly due to the lack of specific criteria related to their waste feedstocks, but also due to an increase in the cost and effort required to acquire a wider range of supporting data.
- Organisations experience more (or less) difficulty with the self-assessment depending on the (range of) applications they want to pursue with their recycled product, and how strictly safety requirements are defined in corresponding product legislations.

4.3 Applying for a EoW ruling issued by authorities

Communicated feedback on the EoW system often related to the geographically fragmented approach to obtaining an EoW ruling from a local environmental authority. Comments included:

- For organisations that require a large investment, an EoW ruling issued by an authority can be instrumental to reassure investors that there are no issues with their EoW status. However, interviewees communicate that the process to obtain a ruling from authorities is too slow, leaving an EoW self-assessment the only available option to convince investors.
- It is not easily apparent which body is responsible for handling and evaluating cases. Interviewees communicate that the “*Omgevingsdiensten*” and the Ministry I&W (previously in charge of handling the EoW rulings) occasionally point to each other when it comes to handling cases.
- Within some of the “*Omgevingsdiensten*” it can be difficult to find the person in charge of EoW. Additionally, the “*Omgevingsdiensten*” do not always have the sufficient knowledge and/or capacity to give these cases proper scrutiny. Interviewees communicated that EoW cases were rejected for practical reasons such as lack of time. Due to the reported

knowledge and capacity gap⁴¹, it was argued that the “*Omgevingsdiensten*” rely (too) heavily on the RIVM framework. Thereby also adopting its shortcomings and potential misalignments with individual cases.

- Non-data related aspects, such as the aesthetics of the recycled product, might influence the ruling issuance. Whether something does or doesn’t “*look like a product*” is unrelated to EoW criteria compliance, but can still influence decision making.
- Slow handling of cases due to under capacity at the “*Omgevingsdiensten*” creates problems for businesses that rely on receiving an official EoW ruling. This is especially pertinent when the ruling is needed for attracting investment funding, setting up contracts with customers, or permitting.
- The time dedication and financial investment required to obtain an EoW ruling for “*first movers*” is perceived to be relatively high. Both the applicant organisation and the legislators and evaluating authorities had little experience with the self-assessment for these cases. This is why significant time and effort were initially required to build capacity on both sides. However, according to interviewees the efficiency gains for future cases were less than anticipated. The remaining lack of clarity around requirements, as well as the slow handling of cases, reduces the potential for efficiency gains.
- Lack of available capacity and knowledge could result in hesitancy from the “*Omgevingsdiensten*” to assess a specific case. This was perceived to be due to a level of risk aversity and, in part, the result of wanting to stay away from setting precedents.
- Interpretation of the adherence to the EoW criteria and thus when compliance can be claimed differs depending on which “*Omgevingsdienst*” is involved in the evaluation. This is argued to be related to the generic character of the EoW criteria and the RIVM framework.
- Rulings issued by “*Omgevingsdiensten*” are not necessarily accepted by other public authorities. This means that organisations are either restricted to a specific geography, or dependent on multiple EoW rulings for the same recycled product.
- Some interviewees questioned the added value of the ruling as the rulings are issued by “*Omgevingsdiensten*” with limited (geographical) jurisdiction, and do not carry legal value.
- Rulings issued in a Member States (whether locally issued or not) are not necessarily accepted by other EU countries. This impedes selling across borders and can create issues with transportation.
- Local environmental authorities are bound to legislation such as the “*Wet Open Overheid*” (WOO), formerly “*Wet Openbaarheid van Bestuur*” (WOB), that ensures transparency in the decision-making process in the public domain. The EoW criteria requires companies to describe internal processes in detail within their EoW dossier. This information is then shared with the authority to reach a decision. However, company specific information might be compromised if the authority makes information exchanges public after a WOO request.

Interviewees communicated several issues related to slow handling of cases and the absence of ruling issuance:

- Cross-border transport introduces a high risk and might be prohibited on improper grounds. Customs agencies and border control can often not distinguish waste from a recycled product. In these situations, the self-assessment does not suffice. At the same time non-

⁴¹ These issues (amongst others) have been noted in the report on the implementation of this decentralised system. The observations are included here: *Om de leefomgeving; omgevingsdiensten als gangmaker voor het bestuur, Adviescommissie Vergunningverlening, Toezicht en Handhaving, 2021*

compliance with waste transport legislation such as EVOA can result in criminal charges. This is a significant risk that withholds organisations from operating on the broader European market. Even if transport complications can be tackled by obtaining an EoW ruling, legal uncertainties remain because rulings have no legal value and are not valid in other Member States.

- Legal uncertainty is introduced because it is unclear whether production and sales of the recycled product might be restricted in the future after authorities have evaluated the case.

4.4 Potential solutions suggested by interviewees

Interviewees suggested various potential solutions on the short-, medium-, and long-term to improve the EoW system and take away barriers that were experienced. Suggested solutions include:

- **Harmonization:** Ideally there would be an EU-wide framework that unifies the self-assessment, evaluation, and EoW ruling issuance process across all Member States. This would ensure a level playing field across countries and equal interpretation of what EoW compliance entails.
- Further clarification of the safety risk assessment as part of self-assessment. Criteria, substance limit values, and guidance, should be tailored to specific product groups and applications. This is argued to be beneficial for both companies building up the EoW dossier, as well as the authorities performing the evaluation.
- Compliancy requirements for the criterion 3, “Proving lawful use for its intended application”, should be harmonised with, or directly adopted from, product legislation (if such legislation is available). This ensures that both virgin and recycled products are subject to the same requirements. Currently, the compliance to EoW criteria and product legislation are perceived and experienced as two separate steps.
- Allow the inclusion of multiple intended applications within one EoW ruling for the same recycled product. This reduces both the time spent on conducting the self-assessment and the time spent by the authority evaluating it. Consider combining applications from across an entire sector, instead of a single application. This is especially relevant if the risks attached to these applications are deemed similar or have large overlap. For example, a recycled product intended for various agricultural applications would receive a single agricultural application ruling, instead of one ruling for each potential application.
- **Centralisation:** In the long term, the EoW ruling issuance and associated evaluation will ideally be centralised within one European entity. In the medium term, both should be centralised nationally within one Dutch entity. In the short term, a national support desk dedicated to EoW should be set-up. This support desk can support both local authorities and companies applying for a ruling. It should be mentioned that before the delegation of the EoW evaluation to the “*Omgevingsdiensten*”, RWS already had an EoW support desk with subject matter experts installed. The original set-up was appreciated by the interviewed companies. The (re)instalment of such a national EoW support desk, working group, or similar entity, could have several benefits:
 - Cases can be evaluated more efficiently, reducing processing times. A maximum of three months from the point of application to the point of ruling issuance/rejection was indicated in one of the interviews.
 - It will be clear where to find EoW experts that can answer questions about compliance requirements or the process itself.

- A broader and deeper knowledge base can be formed and maintained about the topic.
- There are potential cost-savings on a national scale because of efficiency gains. The hypothesis is that it is more efficient to have a few specialists that are full-time dedicated to EoW, instead of allocating a larger number of regional officials to develop EoW expertise.
- The credibility of issued rulings might be enhanced, both nationally and internationally, when a national entity is involved in the process.
- If EoW ruling issuance is not centralised, interviewees suggested to focus on the development of legislation that ensures the cross-regional and cross-border acceptance of locally issued rulings.
- Interviewees advocate that (small scale) demonstrators operating in controlled environments should be provisionally exempted from EoW criteria compliance. Doing so will lower barriers to conducting joint R&D efforts.
- For well-established recycling processes, a certification scheme could be developed to replace evaluation by local authorities. This would only work if certifiers are also officially recognised by authorities. Such a certification system could free-up capacity at authorities where time could be better spent on novel or niche cases that require more tailored evaluation. There are already certification programs for plastics recyclers, such as the EuCertPlast certification, although this certification is focussed on the recycling process rather than the recycled product.
- If companies are required to obtain an EoW ruling issued by an authority, this ruling should also have a legally binding character. Only if rulings have legally binding character can uncertainty be eliminated with regards to investments or the compliance with related legislations such as EVOA. However, a negative outcome should not lead to a definite rejection. Instead, companies should be allowed the time to improve their processes and evidence base.
- Applications should always be handled regardless of capacity and knowledge gaps at authorities or a case's degree of difficulty.

4.5 Perspectives from the stakeholder questionnaire

A stakeholder survey was conducted through running an online questionnaire. The questionnaire intended to explore whether the views identified during the interviews were shared by the broader group of recyclers. To this end, the questionnaire was circulated within the GCNE network of recyclers. In Annex I the full set of responses is included for further reference.

The survey responses show a high-degree of overlap with those views provided by the interviewees. The recyclers understand the need for providing evidence on their recycling technology and indicate that developing the evidence base is possible. However, legal certainty and the procedure around the EoW ruling are seen as pain-points. When asked about the potential areas for improvement, the following suggestions stood out:

- the need to increase legal certainty;
- facilitate acceptance of EoW rulings across Member states;
- provide access to a single point of contact around EoW.

5. Implementation improvements



In this concluding chapter we will provide a condensed overview of the actionable suggestions for policymakers on improving the EoW system. These suggestions, covered in section 5.1, were gained through conducting desk research and interviews. All suggestions have been classified to be actionable either immediately, or in the short-, medium-, or long-term.

The research shows that improvements to the EoW system are certainly needed. However, EoW is still a relevant tool that helps to give credibility to recyclers and prevent unwanted harm to humans and the environment. Therefore, in section 5.2, we highlight the remaining perspectives on the current system. The focus on this section is on benefits and navigating existing barriers. We also give recommendations on how to deal with its current implementation. These recommendations are targeted toward both recyclers in various stages of maturity and investors.

5.1 Suggestions for improvement of the EoW system

This project has identified four main areas of the EoW system that are in need of improvement. Within each of these four categories, pain-points have been highlighted by recyclers during the interview process or during the desk-based research. The four categories are:

- 1) the EoW (Self-) assessment;
- 2) the EoW Criteria;
- 3) Issuing EoW rulings;
- 4) Enhancing the legal certainty around obtaining the EoW status.

The suggested improvements are further divided in 5 themes. These improvement themes are:

- 1) *Awareness*; interventions that can be actioned upon immediately, which increase understanding of stakeholders and investors involved with EoW.
- 2) *Clarification*; where rules, procedures, and compliance requirements are unclear, clarification can be provided in the short-term.
- 3) *Organisational set-up*; specific recycler minded solutions to support the previously outlined suggestions and to facilitate clear processes.
- 4) *NL regulatory harmonisation*; similar to the EU regulatory harmonisation, but intended for change in the medium-term.
- 5) *EU regulatory harmonisation*: improve harmonisation and unification of the EoW system implementation across the EU. This is a long-term improvement suggestion as regulatory change is a slow process, especially when it is required to be developed and approved at higher political levels.

The improvement suggestions are mapped across the four categories (rows) and five themes (columns) in Table 1. They are based on inputs obtained from stakeholders (by interviews and the questionnaire) and expert opinion. Therefore, there is some overlap with the suggestions previously listed in Chapter 4.

Table 1. Suggested improvements

<i>Impr. theme</i>	1. Awareness	2. Clarification	3. Organisation	4. NL regulatory harmonization	5. EU regulatory harmonization
<i>Category</i>	<i>(immediate)</i>	<i>(short-term)</i>	<i>(mid- to long-term)</i>	<i>(mid-term)</i>	<i>(longer-term)</i>
EoW (Self-) assessment	<ul style="list-style-type: none"> • Provide training on the EoW criteria and self-assessment for start-ups & scale-ups (for instance as part of an accelerator program). • Develop an easily digestible guidance document on conducting the EoW (self-) assessment. 	<ul style="list-style-type: none"> • Specify clearly that compliance with product legislation is embedded in EoW criterion 3. • Develop clear guidelines on the minimally required laboratory analysis and exposure assessment to prove safety for EoW criterion 4⁴². 	<ul style="list-style-type: none"> • Set-up a Dutch⁴³ or EU EoW service desk as a contact point to discuss questions about the assessment and to organise outreach. 	<ul style="list-style-type: none"> • Consider an exemption from adherence to EoW criteria for small-scale pilot and demonstration sites (less than 1 ton/year) to facilitate early-stage developments and prospective customer engagement⁴⁴. 	
EoW Criteria	<ul style="list-style-type: none"> • Consider raising awareness on the EoW criteria for specific sectors through relevant industry organisations and events. 	<ul style="list-style-type: none"> • Clarify how intermediate products⁴⁵ (with a range of potential applications) should be handled in NL and in the EU safely. Specifically, when 	<ul style="list-style-type: none"> • Build knowledge and capacity on recycling processes and technologies at the public authority in charge of EoW evaluation (or integrate 	<ul style="list-style-type: none"> • Make national EoW criteria for waste streams that have not been deemed to be a priority by the EU. The WFD and “Wet Milieubeheer” provide the 	<ul style="list-style-type: none"> • The European Commission is working on EoW criteria for specific plastics waste streams⁴⁷, but not for biobased materials (incl. obtained from

⁴² The current framework developed by the RIVM is considered to be difficult to understand, unwieldy and overly restrictive.

⁴³ Potentially expand the remit of this existing helpdesk: <https://www.afvalcirculair.nl/onderwerpen/linkportaal/helpdesk-afvalbeheer/>

⁴⁴ The aim should be to enable the demonstration, but produced recycled materials should not be allowed to enter the market.

⁴⁵ The use of term intermediate product covers all materials intended for further manufacturing. Note that this is a much broader group of products than chemical intermediates under the scope of Article 17/18 of REACH.

⁴⁷ Plastics that will be prioritised are homogeneous plastic: polyethylene terephthalate, low- and high-density polyethylene, polystyrene and expanded polystyrene, polypropylene recovered/recycled from plastic waste, and heterogeneous plastic: mixed plastics waste recovered/recycled from plastic waste.

		those intermediate products can be used as drop-in feedstock ⁴⁶ .	this knowledge in a support desk).	necessary legal provisions to do so.	waste water ⁴⁸). This was not deemed to have priority. Increasing the priority for biobased materials should be considered.
Issuing EoW rulings	<ul style="list-style-type: none"> Inform investors (involved financing circular initiatives) on the limitations of the existing EoW rulings and explain that an EoW status results from the self-declaration based on the assessment made by the recycling company. 	<ul style="list-style-type: none"> Clarify upfront to ruling applicants that the EoW ruling provides no legal guarantee in its current form and to which extent other relevant regulations still apply. This enables companies to make swifter decisions on the relevance of getting a ruling. 	<ul style="list-style-type: none"> Aim for getting support across Member States to organise EoW ruling issuance by a European body or service desk in the longer-term. Centralise Dutch EoW ruling issuance to improve application handling capacity, knowledge access, increase the credibility of the issued rulings. If none of the options listed above are feasible, then the focus should be on sharing knowledge between “Omgevingsdiensten”⁴⁹. 		<ul style="list-style-type: none"> Consider pushing for developing certification schemes for established recycling processes and mandate accredited parties to issue certifications to recyclers⁵⁰ and check compliance. <p><i>(Relevant option for transboundary conformance and compliance in absence of rulings)</i></p>

⁴⁶ For plastic recycling using pyrolysis the resulting intermediate product will be mixed in with naphtha and will thus end up in a very broad range of applications.

⁴⁸ Biobased materials considered: Ammonium salts, bio-plastics and bio-polymers, cellulose, other bio-materials, phosphorus, potassium chloride, sludge from urban waste water treatment and the food industry, and spent coffee ground.

⁴⁹ There is an initiative under development that should both be involved in facilitating knowledge transfer and in validating EoW rulings for specific cases that are looked at by the “Omgevingsdiensten”. This will likely be called “Kennisgremium Afval of Grondstof” and is being developed by the organisation “Inter Provinciale Overleg (IPO)”. There is currently not concrete information available beyond that a decision has been reached on the initial terms of reference for this initiative. However, based on the suggested tasks this could act as the proposed knowledge desk.

⁵⁰ Potentially also feasible for specific feedstock types.

<p>Enhancing legal certainty around obtaining the EoW status</p>	<ul style="list-style-type: none"> • Raise awareness on current legal limitations of an EoW ruling, and update companies when this changes. Highlight that self-declaration is sufficient. 		<ul style="list-style-type: none"> • Set-up a Dutch⁵¹ or EU EoW service desk as a contact point to discuss questions about the assessment and to organise outreach. 	<ul style="list-style-type: none"> • Make EoW rulings issued by Dutch public authorities legally binding within the Netherlands (for instance within the framework provided by the “<i>Wet Milieubeheer</i>”), to give legal certainty when a positive decision has been reached to affirm the EoW status⁵². 	<ul style="list-style-type: none"> • Strive to make EoW rulings issued in a Member State recognised and legally binding across all Member States. • Allow the EoW ruling to be used as legal proof for cross-boundary transport, specifically when disputes arise⁵³. <p><i>(If there are barriers to organising both suggestions on an EU level consider instead getting bilateral agreements with Germany and Belgium)</i></p>
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⁵¹ Potentially expand the remit of this existing helpdesk: <https://www.afvalcirculair.nl/onderwerpen/linkportaal/helpdesk-afvalbeheer/>

⁵² Several recyclers indicated a need for greater clarity on status the status of pyrolysis technologies in regards to the EoW system.

⁵³ Aim for amending article 28 of the International Waste Shipments Regulation (No 1013/2006). When exploring if this feasible, make sure to consider how amending the article relates to the Basel Convention.

5.2 Remaining perspectives on the EoW system

In this final section we will discuss some of the remaining perspectives on the current EoW system. We will consider specifically how it can provide opportunities and how to tackle some of the key barriers. We will also discuss how compliance with the EoW criteria provides a licence to operate for recyclers, with the self-assessment as a supporting structure for demonstrating safe and lawful use. Finally, we reflect on the pro's and con's of the EoW ruling, as obtaining a ruling currently receives considerable attention in the recycling sector. This section is tailored to recycling companies and investors, as the discussed topics are supported by recommendations on dealing with EoW at different maturity stages and the from an investment perspective.

Adhering to the EoW criteria provides a licence to operate

The EoW criteria are designed to establish that a recycling process provides a clear benefit to society. It decreases the chance for unmanaged and/or unintended consequences. Given the large number of legacy substances, it is paramount to prevent recycling from creating regretful substitutions. The EoW system therefore function as a framework to safeguard against safety risks and give credence to the recycler's intentions. Complying to the criteria is the foundation of the "licence to operate" for a recycler.

Lastly, the EoW system acts as a guardrail against optimistically selling recycled products for a range of applications, whilst not being sure what really happens to them. EoW compliance therefor reduces the likelihood of public relation blowbacks, an example of which is the PR blowback around the (perceived) safety risks of using rubber granulate on sporting fields. RIVM still mitigates the fall-out of this on their website⁵⁴.

Start-up & scale-up

- Taking the EoW criteria seriously and proving that they are compliant is challenging for early-stage companies as the available evidence is likely not sufficient at this stage. However, on the other hand, it does provide an opportunity to stand-out as a growing company. Companies that have a good understanding and narrative on the (prospective) EoW status inspire confidence and reduce doubts from customers, investors, public authorities, and other relevant third-parties. Having a plan to obtain the required evidence base shows stakeholders that proving EoW status is receiving the necessary attention.
- Furthermore, having a well-developed understanding of what is required helps with identifying hazards and safety risks early on. This allows for developing either operational procedures or practical solutions to tackle these hazards and risks properly. Additionally, it helps with choosing feedstocks and applications that are less risky from a range of options that are being considered at this stage. It can also help to identify the extra processing or waste treatment steps that are necessary to reduce risk and increase the safety of a given application.

Commercial scale

- Establishing an operational recycling facility at a commercial scale requires several activities to come together. This includes, but is not limited to, EPC (engineering, procurement, construction), contracting the technology package provider, obtaining building and environmental permits, insurance, signing take-off agreements with customers, and arranging financing. This partly builds on experiences gained during the scale-up phase, but financiers and customers will want to see that nothing is left to chance. Conducting the self-

⁵⁴ <https://www.rivm.nl/veelgestelde-vragen-rubbergranulaat>

assessment and developing (and continuously refining) the body of evidence gives the necessary assurance. As explained in Chapter 3, an EoW ruling is not a prerequisite to prove that the EoW status is reached, and thus this can be communicated as such.

- Declaring the EoW status and having access to the supporting proof can also be useful for other activities that need to be navigated at the same time. For instance, obtaining environmental permits or planning permission for building the commercial scale recycling facility. The existing evidence base can be used to support the arguments around environmental safety. Lastly, it can be useful in case civilians voice concerns and file an objection during planning permit consultation processes.
- For large scale investments it is noted that a lack of clarity on the legal status around EoW can still create a substantial barrier. In this case it can be considered an option to start a legal procedure in order to get the required clarification through means of a court decision. However, this is generally considered to be a last resort as it would be preferred if legal clarity could instead be given by a regular procedure.

Investor perspective

- Early and later stage companies that know how to comply with the EoW criteria are less risky investment prospects. They have a lower chance of creating a public relation disaster due to (perceived) mishandling of waste and are better prepared for dealing with public authorities on the safety aspects related to their recycling process. These companies understand that handling waste comes with its own hazards and risks, which need to be mitigated, managed, and reported on with solid evidence. They can explain the limitations around the intended application(s) of their recycled products and develop a strategy to mitigate these limitations. Even without an EoW ruling it is a clear sign that the company knows what is required to operate as a recycler.

A structured format for evidence building and demonstrating safe-use

The EoW criteria provide a structured and coherent format for conducting the self-assessment. They enable both the creation of a narrative and the building of a body of evidence for the complete recycling process (feedstock, treatment/recovery, and product). Although the criteria are generic in nature, they force a recycler to consider how to prove each aspect that is included and therefore ensure safe recycling.

A recycler can start with developing the narrative for each criterion first, obtaining the necessary supporting evidence later. In doing so, the company can gradually work towards claiming EoW status and, if desired, obtain an EoW ruling. The criteria also force a recycler to develop a clear understanding of their obligations around relevant (product) legislation, such as REACH. Lastly, it enables the company to identify the need for additional process controls or waste treatment steps in order to guarantee safety in its intended application.

Start-up & Scale-up

- Given that during the start-up and scale-up many aspects are still in flux, it is likely impossible to be able to show full compliance. Nonetheless, it is still possible to build a clear roadmap on how and when the needed information will be obtained. Furthermore, it allows a gradual focus on the intended application(s) that will be elaborated down the line in the self-assessment. This is beneficial as the range of potential applications that are explored during the start-up stage can be broad and shifting, whereas they generally become more defined during the scale-up stage, and are narrowed down further afterwards. The final set of applications becomes clear when negotiations with launching customers are finalised or

when investment in a facility is sought. Meanwhile, it is important to know what you need to do and when it needs to happen. The criteria provide the framework for doing so.

Commercial scale

- At this stage of maturity:
 - the intended application is clear;
 - the process technology is chosen;
 - the waste sourcing strategy is in place;
 - the (first) offtake agreements with customers are signed;
 - the operational and process control procedures are designed and implemented;
 - the first production batches can (soon) be tested.

The level of information that is now available makes it possible to support the self-assessment with the relevant proof. At this point it becomes valid to make a self-declaration that the recycled product has reached the EoW status.

Investment perspective

- The EoW criteria, albeit broadly defined, give clear structure in which to report on the safety of the recycled product. For an investor it offers a standardised framework to understand if a recycling company stands a good chance of navigating the legislative requirements and if it can be convincing to customers who want to buy a recycled product instead of a waste. The framework is therefore both useful for exploratory talks with early-stage investment prospects, and as a tool for continuous engagement going forward.
- As an investor active in investing circular solutions and recycling, it can be useful to have access to expertise on the EoW criteria and the self-assessment, either through building internal capacity or hiring external support. It helps identifying showstoppers earlier, and enables comparing different investment cases in recycling within the same format.

Tackling EoW ruling requests from customers and/or investors

Customers or investors can ask for an EoW ruling during negotiations. From their perspective this makes sense as both investing in, or purchasing from, recyclers entail accepting a range of risks. The material composition can vary and contaminants might still be present after treatment and recycling steps. Adhering to the EoW criteria and conducting the self-assessment gives a company a strong body of evidence to reduce these risks. However, for a customer or investor it is generally easier to require an EoW ruling to be present. This is because it is a means to rely on the evaluation of the EoW assessment by the authority. Asking for this declaration provides them with a straightforward risk mitigation strategy and reduces the resource investment needed to evaluate the EoW assessment themselves. Also, if disaster strikes, the investors and customers can then point out that they based their decisions (to invest in or purchase from the recycler) on the judgement given in the ruling. This limits their exposure to liabilities and, specifically for customers, it serves as a safeguard for being seen as a waste processor (with the associated need to have waste transport and handling permits).

Start-up & scale-up

- As stated previously, the required information and proof points are most likely not there yet. This prevents start-ups and scale-ups from obtaining a ruling. In addition to the difficulties experienced around obtaining the ruling and the limited legal certainties offered by the ruling (see section 3.1), this can result in a deadlock. The start-up or scale-up cannot obtain the ruling, while the customer and investor insists on the ruling to continue pursuing a

relationship. This chicken and egg situation leaves the company with no other option than to explore leads that have a higher risk or accept that adherence to the criteria and reaching the EoW status is a longer-term process that can be supported by a future application for a ruling.

- Spin-outs from existing companies (with previous experience with the EoW system) are generally better positioned as they can leverage the experience and resources from their parent company. This can help with reducing gaps in the evidence base earlier, and thus stand a better chance of obtaining the relevant information to prove adherence.

Commercial scale

- At this stage of maturity, the aforementioned chicken and egg problem can be overcome. However, it can still require significant resource allocation and needs to be given internal priority. The maturing company is better positioned to finalise the assessment and, afterwards, engage with the public authorities. When applying for a ruling based on their evidence, they will still be dependent on the turnaround time of the “*Omgevingsdienst*” that issues the ruling. This means that lead times might be difficult to predict beforehand, which can result in a lack of progress obtaining the ruling impacting the discussion with investors and prospective customers. In this case it also makes sense to consider parties with a higher risk appetite, or at least communicate upfront what can be expected in regards to timelines after checking with the “*Omgevingsdienst*”.

Investor perspective

- Having access to an EoW ruling has its advantages from an investment risk mitigation perspective, but it also excludes potentially interesting prospects. This is tragic as they generally cannot provide the ruling for reasons outside their direct sphere of influence. It would be better to consider each case on its own merits. For instance, by evaluating their self-assessment instead. The distinct barriers to obtaining a ruling, and the limited legal value of a ruling, make the evidence base developed through self-assessment better suited for the risk mitigation associated with investing in new recycling ventures. The assessment can be used for all stages of maturity, from start-ups, to companies that are breaking into commercial scale. It gives a good overview of how the company would argue compliance and what is still needed. Furthermore, a second opinion can be sought as part of the due diligence process. If for any reason the ruling is still deemed necessary, it is best asked from maturing companies only and with an understanding of the longer lead times around obtaining it.

Annex I

A brief questionnaire (with six closed and three open questions) was developed and shared with the GCNE network. The questionnaire is a supplement to the previously discussed in-depth interviews. Eight respondents have reacted who are involved in setting-up a recycling initiative or have already done so. This questionnaire intended to gather extra insights and perspectives on the EoW (self-) assessment, status and ruling, beyond what was learned from the interviews (see Chapter 4). The aim was to understand if similar aspects would surface from the GCNE network. Due to the specificity of the topic, there were less responses than expected, but almost all of them were directly involved in recycling initiatives.

Some details on the respondents:

- More than 60% of the respondents are from the Netherlands and are active in industrial clusters in South-Holland, Zeeland, Limburg, North-Brabant, and Gelderland
- The recycling initiative maturity of the respondents is:
 - start-up and scale-up phase (26%);
 - commercial scale (25%);
 - the other 49% have already entered the market.
- The respondents indicated using the following waste streams (multiple options possible):
 - 1 mixed (post-consumer) polymer waste;
 - 3 homogenous polymer waste streams;
 - 3 biobased waste material;
 - 5 other waste streams.

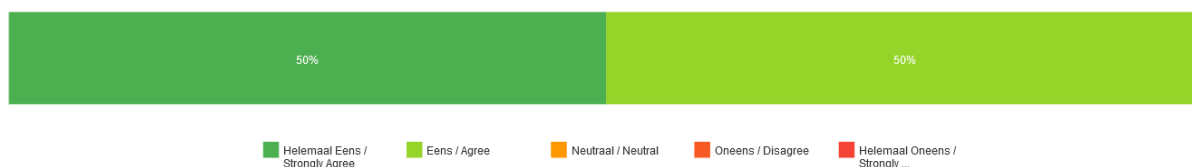
Outcomes questionnaire

Closed questions

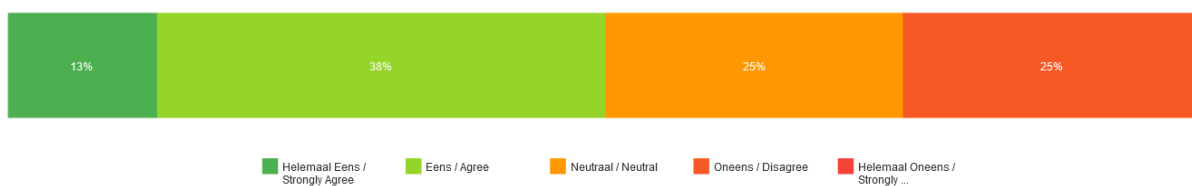
The bar graphs below present the results given by the respondents on the closed questions of the questionnaire. The overall view is that the companies are aware of the need to do a self-assessment, but 50% see issues with data collection and provision. Only 13% agree that the procedure is clear when it comes to obtaining the EoW status with a ruling, with 50% stating this is absolutely not the case. This party also extends into the practical feasibility of obtaining the ruling, albeit the opinion is more inclined to be neutral here (50%). Lastly respondents view that having the EoW status is required by their customers and for getting follow-up investment. The respondents overwhelmingly agree on both. It is likely that the respondents expect this EoW status to be derived from the EoW ruling and not from the self-assessment due to the phrasing of the previous questions.

The responses per question are listed below:

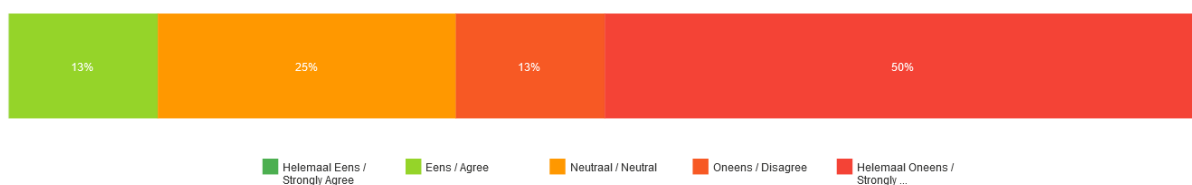
Question:



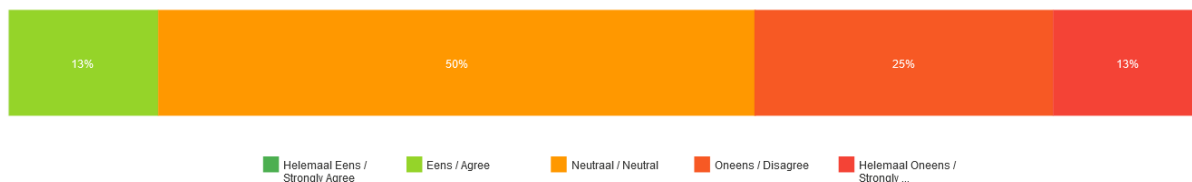
The required data collection and provision of evidence for the End of Waste assessment is feasible



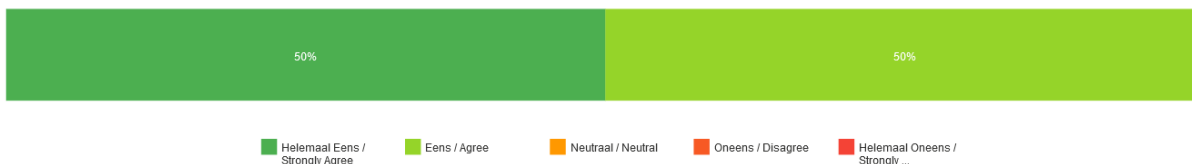
Question: The procedure for applying for an EoW status with the competent local authority is clear



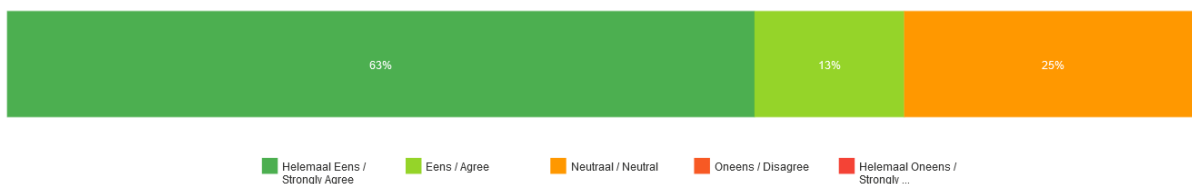
Question: The process of obtaining an EoW status from the appropriate local authority is practically doable



Question: An EoW status is necessary for customers of the company



Question: An EoW status is a condition for obtaining a (follow-up) investment



Open questions

The overview below organises the answers provided by the respondents on the three open questions. The questions are:

- What obstacles do you experience around the End of Waste process?
- What opportunities do you experience in obtaining an End of Waste status?
- Where do you see room for improvement of the End of Waste process?

The provided answers are covered in table 2. The reactions have redacted to group them across topics and to take out company specific or sensitive details.

Table 2. Response to Open questions

Aggregated topics	Open questions		
	1. Barriers	2. Opportunities	3. Improvement suggestions
EoW status	<ul style="list-style-type: none"> • Legal uncertainty around cross-border transport • Uncertainty around enforcement 	<ul style="list-style-type: none"> • Having the EoW status is a 'licence to operate' • Can provide clarity on the status of recycled intermediate products 	<ul style="list-style-type: none"> • Make it more difficult to handle waste, while reducing the burdens for recycling and recovery
EoW ruling	<ul style="list-style-type: none"> • Uncertainty around the legal status of the EoW ruling • Perception that all customers require a ruling to proof the EoW status • Procedural and data security challenges 	<ul style="list-style-type: none"> • More markets across the world can be accessed with the EoW ruling • Can be used as evidence to customs to prove a product is transported 	<ul style="list-style-type: none"> • More markets across the world can be accessed with the EoW ruling • Can be used as evidence to customs to prove a product is transported
Evidence base	<ul style="list-style-type: none"> • Having access to external expertise is almost necessary to apply for a ruling • Unclear on what is exactly required, especially on aspects such as proofing market demand and on what analytical tests are needed to prove safety 		<ul style="list-style-type: none"> • Increase understanding at public authorities on recycling processes • Provide guidance or a framework on what is required • Foster industry-wide and cross-European cooperation
Procedure	<ul style="list-style-type: none"> • Unclear which public authority is in charge and can make a final judgement • Long procedural lead times 		<ul style="list-style-type: none"> • Access to a single contact point for obtaining the ruling • Provide clarity on process steps