BOOST-IN

Uptake of innovative and circular solutions for water

Experiences and lessons learned from End-of-Waste criteria of circular products

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ABSTRACT	This report summarizes the current situation on End-of-waste (EoW) applications and procedures for circular products from water. Based on a review of reports, stakeholder interviews and workshops, it describes status and challenges of different routes to achieve EoW status for water-related products. EU-wide harmonisation of related EoW criteria has a low political priority, mainly due to low-volume products and niche markets addressed. However, there are on-going initiatives and enabling political frameworks that could facilitate EoW applications for new products from the water sector. Next steps are proposed to overcome the existing bottlenecks for successful EoW applications.		

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ABBREVIATIONS

CE	*Conformité Européenne (*EU conformity)
CEAP	Circular Economy Action Plan
CMC	Component material category
EoW	End-of-Waste
ESPP	European Sustainable Phosphorus Platform
FPR	Fertilising Product Regulation
GCNE	Groene chemie, Nieuwe Economie (Green Chemistry, New Economy)
JRC	Joint Research Centre
PE	Population equivalent
PMC	Product function category
WFD	Waste Framework Directive
WWTP	Wastewater treatment plant

EXECUTIVE SUMMARY

This report was produced within task 3.4 of work package 3 of the BOOST-IN project. The overall goal of the task is to promote harmonized End-of-Waste (EoW) criteria for circular products from the water sector.

As a foundation for this work, this report summarizes the current situation on EoW applications and procedures for water-related products. Based on a review of reports, stakeholder interviews and workshops, it describes status and challenges of different routes to achieve EoW status for water-related products.

Currently, achieving an EoW status for circular products from water is still seen as a major barrier for business development and market uptake by many stakeholders in this field. The lack of national or even EU-wide EoW criteria for many innovative circular products leads to case-by case decisions, which have to be developed by individual companies in collaboration with relevant authorities. This process is time-consuming, costly, and requires specific expertise on both sides, and thus poses uncertainty and risks to investment decisions and market development. A major bottleneck is the necessary risk assessment and the development of acceptable limits of contaminants for specific products and use cases, for which methods and procedures are complex and often beyond the capacity of companies and regulators.

For selected fertilising products, EU-wide harmonised EoW criteria have been set at EU level, which can be regarded as a best-practice to overcome this market barrier. However, related certification costs are still challenging business models especially for low-volume production sites.

Further EU-wide harmonisation of EoW criteria for water products currently has a low political priority, mainly due to low-volume products and niche markets addressed. The Joint Research Centre regularly develops technical proposals for harmonised EoW criteria in a multi-stakeholder process, but only if the political mandate is given by the European Commission. Upcoming political frameworks such as the Circular Economy Act will be a window of opportunity to put the challenge of EoW criteria for circular products from water higher on the political agenda.

Another potential route to reach EoW status is the self-declaration of companies without direct collaboration with authorities. However, this route is less reliant for companies as EoW status can be challenged in court by any third party. Still, there is a growing interest in this route by innovators due to its faster timeline, and related tools to support companies in this process are under development.

From the perspective of stakeholders and companies involved, further exchange and collaboration on the challenges of achieving EoW is required to support innovators and producers of circular products in their route to market. The BOOST-IN project will continue to support these activities by facilitating exchange and know-how transfer between innovators and regulators and by promoting future harmonisation of EoW criteria for circular products from water on EU level.

1.0 INTRODUCTION

1.1 Context of this report

The recovery of value products out of municipal or industrial wastewater is a key concept of circular economy (CE) in the water sector. Wastewater contains a variety of valuable organic and inorganic substances, which can be recovered and used as secondary raw materials or products for different applications. Examples include nutrients (e.g. P, N, K), organic matter (e.g. biomass, cellulose, bio-plastics, EPS) and inorganic salts and components (e.g. Ca, Mg, Na, Cl, SO4), but also the water itself.

When recovering a substance from wastewater, this substance usually remains in the legal status of a waste. Therefore, the substance can only be handled, processed and sold under the legal regulations of the Waste Framework Directive (WFD). For an output from a waste stream to be legally accepted as "not waste" any longer, the WFD has set the principle of "end-of waste" (EoW) and defined a set of specific conditions and related EoW criteria to be fulfilled by the product (Figure 1). For each substance that leaves the waste regime and will be placed on the market as a product, the producer or owner of that substance has to prove the fulfilment of this EoW criteria.

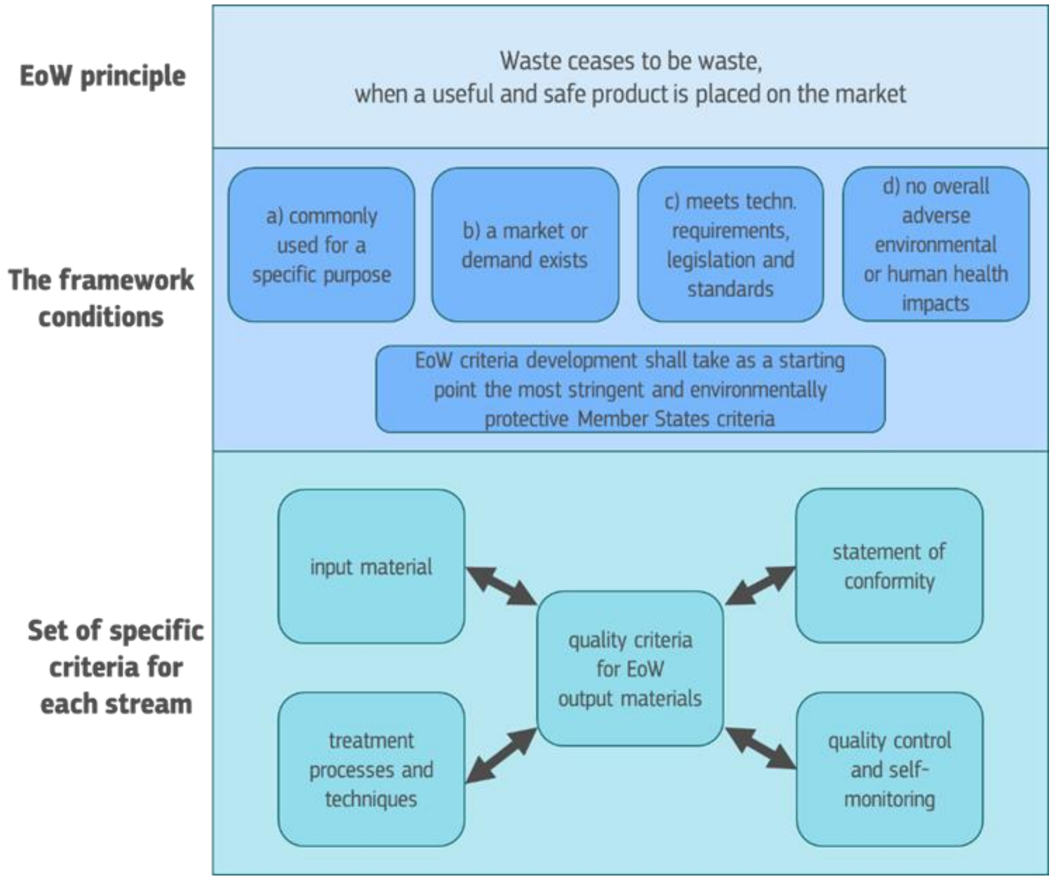

Figure 1: End-of-waste: Principle, framework conditions and end-of-waste criteria (© JRC)

In principle, the producer or owner has to prove to the relevant national authority in an EU member state that the product

1) is used for a specific purpose
2) has a market or demand
3) meets technical requirements, legislation and standards
4) does not pose an unacceptable risk to human health or ecosystems.

These steps are typically done with an EoW dossier, which contains the relevant information and forms the basis for granting EoW status to a specific product.

However, defined and harmonized EoW criteria do not yet exist for a variety of new or emerging products from wastewater (e.g. cellulose, bioplastic, algae biomass). This means that the producer or owner has to collaborate with the relevant authority and to develop and prove suitable EoW criteria on a case-by-case basis, which should finally be accepted by the authority to fulfil EoW requirements. This procedure has been identified as a critical barrier for introducing new products from wastewater into the market. Major obstacles here are the time needed for EoW application (typically several years), lack of technical expertise and know-how on the topic at both producers and authorities, lack of resources at the authority to process EoW applications, and also the risk that on-going EoW applications might finally not be accepted.

Without EoW status, recovered products from wastewater will face major difficulties in successful marketing. Remaining in the waste regime restricts market access and cross-border transport and trade, limits potential revenues and prohibits end-user and consumer acceptance of recycled products. Therefore, the business case for recovery is often negative without EoW status, thus preventing investment and value chain setup. Hence, promoting and enabling a faster, less risky and less expensive route to achieve EoW status is critical for the market uptake of CE products from wastewater. This can be reached by harmonisation of EoW criteria on a national or international level, so that clear rules are set to be followed in order to obtain an EoW status. Alternatively, the procedure to develop specific EoW criteria can be made clearer and more explicit, which would enable a more efficient process for both sides in individual EoW applications. Finally, the overall concept of EoW in its current form has also been challenged in its entirety as a barrier for circular economy (Johansson and Forsgren, 2020; Johansson, 2023).

1.2 Goal of this report

The lack of harmonised EoW criteria for CE products from water was recognized as a major barrier by the EC and also by relevant stakeholders from the sector. To address this challenge, the BOOST-IN project has the task to promote EU-wide harmonisation of EoW criteria for recovered products from wastewater.

As a first step in this process, the present report summarizes the current situation around EoW criteria for products derived from wastewater. Specifically, it addresses the following aspects:

- Review of local, national and EU situation in EoW criteria for products from wastewater
- Recent experience of stakeholders with EoW applications
- On-going initiatives to facilitate EoW applications

This analysis forms the basis for follow-up activities in the project to promote future harmonisation of EoW criteria and alleviate this critical barrier for wider market uptake of resource recovery in the water sector.

2.0 METHOD

This chapter shortly summarizes the method used to compile information in this report. In general, the information is based on a review of expert reports, interviews with selected key stakeholders, and workshops to exchange with experts.

2.1 Review of reports

Relevant reports on EoW have been reviewed for this work. This includes the following legal and/or official documents:

- **EU Waste Framework Directive** which sets general EoW requirements (EC, 2008)
- **Reports of the Joint Research Centre** (JRC) of the EC on the topic of EoW:
    - General overview on the development of EoW criteria (Delgado et al., 2009)
    - Practice to derive and apply EoW criteria in EU member states (EC, 2020)
    - Scoping study to prioritise development of harmonized EoW criteria for products from specific waste streams (Orveillon et al., 2022)
- **EU Fertilising Product Regulation** which sets general rules for fertilising products, including automatic EoW status for selected recovered products from wastewater (EC, 2019)

In addition, selected reports and materials that describe the current situation for CE products from water and/or propose routes to further harmonisation and facilitation of EoW applications have also been analysed:

- Report of the **Interreg NWE project WoW** "Wider business Opportunities for raw materials from Wastewater" (Dijkshoorn and de Best, 2020)
- Joint letter of the **European Sustainable Phosphorus Platform** (ESPP, 2021)
- Factsheets on EoW for selected products from **EUREAU** (EUREAU, 2021)

2.2 Stakeholder interviews

Based on the review and the existing network of contacts, key stakeholders for this topic have been approached and interviewed in individual sessions about the current situation in EoW applications and harmonisation of EoW criteria (Table 1). This includes stakeholders from tech suppliers, consultancy, value chain managers, retailers, policy experts, and researchers in this field.

Table 1 List of interviews with selected stakeholders

Interview partner	Affiliation	Function
Coos Wessels	Cirtec B.V. (NL)	Technology supplier for cellulose recovery
Francesco Fatone	Universitá Polytechnica de la Marche (IT)	Researcher on CE concepts and co-chair of IWA resource recovery cluster
Ludwig Hermann	PROMAN (AT)	Consultant on fertiliser products and former president of ESPP
Olaf van der Kolk	AquaMinerals (NL)	Value chain manager for products from Dutch water companies
Aalke de Jong	AquaMinerals (NL)	Value chain manager for products from Dutch water companies
Joachim Clemens	Soepenberg (DE)	Retailer of fertiliser products
Lukas Egle	Joint Research Centre (ES)	Policy expert on EoW harmonisation

Topics of the interviews were the current status of EoW applications in the water sector in general, case-specific barriers and experiences from actors, on-going initiatives and networks to facilitate EoW for new products, and links to other stakeholders for future activities of BOOST-IN. The insights of the interviewees helped to identify other relevant stakeholders and topics for the following workshop formats. Specific challenges raised by the interviewees are discussed in the chapters below.

2.3 Workshops

Based on the outcome of the stakeholder interviews, two workshops have been organized to exchange experiences and state-of-play for EoW applications of wastewater-derived products. These events introduced on-going initiatives in this field and discussed potential actions to facilitate EoW applications on various levels.

The first workshop was an **expert workshop** by invitation only and took place on March 14th 2025 in an online mode. In this workshop, 20 participants came together from different stakeholder groups and countries in Europe (i.e. DE, AT, NL, UK, BE and ES), including partners of BOOST-IN and also the sister project CIRSEAU (Table 2). Participants gave invited presentations for selected topics:

- Route to harmonized EoW criteria (L. Egle, JRC)
- Best practice: EOW in the Fertilising Products Regulation (L. Hermann, PROMAN)
- Challenges in EoW certification (J. Clemens, Soepenberg)
- EoW experiences from a tech provider (F. Babin, Cirtec)
- EoW experiences from a trader perspective (A. de Jong, AquaMinerals)
- EoW in the UK water sector (D. Tompkins, WSP)
- Dutch initiative on self-assessment tool (E. van Dobben, AquaMinerals)
- EUREAU activities in EoW for the water sector (S. Mouret, EUREAU)
- EoW activities in sister project CIRSEAU (K. Wencki, IWW)

The workshop provided a full overview of EoW challenges, current status of legal processes, and on-going initiatives. The participation of JRC in the workshop programme helped to illustrate the route to EU-wide harmonisation of EoW criteria for new products, also pointing out the requirements to start such a process, its resources needed, and the current political priorities in developing EoW criteria for new products from different sectors.

The content presented and discussed in this workshop forms an important basis for summarizing the state-of-play and on-going initiatives ion this field. The first workshop was designed as an **expert workshop by invitation only**, featuring a **limited number of participants**, a **clearly structured programme**, and **ample time for discussion**. This format was effective to allow the exchange and learn about the situation from different perspectives and will be taken up in future activities in BOOST-IN, involving this expert group and more contacts from the growing network.

At the end of this workshop, a series of conclusions and ideas for follow-up actions have been formulated by the group, which are presented and discussed in the following chapters. This will also be taken up by the BOOST-IN work in the second half of the project.

Table 2 List of participants of online expert workshop (March 14th 2025)

Participant	Affiliation	Function
Christian Remy	Kompetenzzentrum Wasser Berlin (DE)	Researcher
Anne Kleyboecker	Kompetenzzentrum Wasser Berlin (DE)	Researcher
Fabian Kraus	Kompetenzzentrum Wasser Berlin (DE)	Researcher
Lukas Egle	Joint Research Centre (ES)	Policy expert
Ludwig Hermann	PROMAN (AT)	Consultant
Ronald Farrar	PROMAN (AT)	Consultant
Minja Marijanski	PROMAN (AT)	Consultant
Flora Babin	Cirtec B.V. (NL)	Technology supplier
Aalke Lida de Jong	AquaMinerals (NL)	Value chain manager
Emma van Dobben	AquaMinerals (NL)	Value chain manager
David Tompkins	WSP (UK)	Consultant
Ania Escudero	Glasgow Caledonian University (UK)	Researcher
Eelco van Ijken	Ecomatters (NL)	Consultant
Joachim Clemens	Soepenberg (DE)	Retailer of fertiliser products
Kristina Wencki	IWW Institut für Wasserforschung (DE)	Researcher
Rafael Sosa Solano	IWW Institut für Wasserforschung (DE)	Researcher
Sebastien Mouret	EUREAU (BE)	Network association
Rafael Casielles	Bioazul (ES)	Consultant
Thomas Track	DECHEMA (DE)	Network association
Aleksandra Jurewicz	DECHEMA (DE)	Network association

Following this expert workshop, the BOOST-IN consortium organized a **public workshop on EoW** in the water sector at the prestigious IWA conference "Resource Recovery 2025", which took place in Leeuwarden (NL) from 19-23 May 2025. This workshop was organized in close collaboration with AquaMinerals (A. de Jong and J. Boorsma) as a key player in this field, as they have relevant experience in marketing of wastewater-derived products and related EoW applications in the Netherlands and beyond. It was held on May 19th 2025 as a pre-conference workshop to the official programme in the city of Leeuwarden.

The goal of this workshop was to publicly present the state-of-play of EoW in the water sector, introduce on-going initiatives to a wider professional audience, discuss experiences of participants with EoW applications, and also get new contacts for future exchange and networking activities.

The workshop was attended by around 30 participants from different countries (Figure 2), with some experts already involved in specific EoW applications for selected products, but also with newcomers in the field from an academic or business background. The event included a set of presentations, and also an interactive part and panel discussion, which was moderated by M. de Leeuw (Van Waarde, NL).

The following topics have been presented:

- Introduction to EoW and relevance for business development (A. de Jong, J. Boorsma, AquaMinerals)
- Harmonisation of EoW criteria (L. Egle, JRC)
- Water Europe expert groups and link to EoW (A. Rubini, Water Europe)
- Introduction of BOOST-IN project and work on EoW (R. Casielles, Bioazul, and C. Remy, KWB)
- Policy context on EoW criteria for the water sector (S. Mouret, EUREAU)
- NL project on self-assessment tool (A. de Jong, AquaMinerals)

Following the presentations, a Q&A session with a panel of experts was held to answer and discuss the input of participants. A valuable input was also made by **Sylvie Grajales from DG ENV**, who joined online for the second part of the workshop and gave her perspective on selected issues.

Overall, the workshop proved valuable to again stress the importance of this topic for business development of CE innovations in the water sector, to involve further stakeholders into the growing EoW network, to learn about their needs and challenges, and also to connect again to EU officials from JRC and DG ENV.

Figure 2 Public workshop at the IWA Resource Recovery Conference 2025 in Leeuwarden (NL)

3.0 STATE-OF-PLAY FOR END-OF-WASTE IN THE WATER SECTOR

3.1 Current situation in EoW applications on national and international level

EU-wide harmonisation of EoW criteria

In general, the topic of harmonisation of EoW application procedures and related EoW criteria is on-going in the EU, mainly driven by the work of JRC on EU-wide harmonisation of EoW criteria for selected large-volume material streams (e.g. plastics, textiles, construction waste). However, the priority of water-related products was ranked low in the last scoping study of JRC (Orveillon et al., 2022), and there are no activities planned by JRC at this point in time to start working on harmonised EoW criteria for water-related products. An exemption for EU-wide harmonised EoW criteria are selected nutrient-related products from wastewater (e.g. struvite, compost), which are now accepted as fertilisers in the current EU Fertilising Product Regulation and thus receive an <u>automatic EoW status</u> as long as they are in conformity with the regulation and are certified with an EC label.

EoW applications for CE products from water

As harmonised EoW criteria are still lacking for the variety of other products potentially recovered from wastewater, tech suppliers and producers of such "new" products are still struggling with the complicated individual applications for EoW in different contexts. Based on the feedback of multiple stakeholders, the current situation in applying for EoW for circular products from water has not improved in recent years. Several stakeholders (e.g. AquaMinerals, Cirtec) reported that some EoW applications have been successful, while others are still on-going and often difficult to conduct. In particular, the following bottlenecks have been identified:

- **Different procedures and responsible authorities** in different EU member states and even regions of the same country (if EoW status is granted by regional authorities), so that existing procedures and EoW dossiers cannot be reused or transferred to other cases.
- **Unclear approach and method to risk assessment** as a central EoW criteria to prevent harm to humans and/or ecosystems from product use. This relates to knowledge of relevant contaminants (e.g. organic, inorganic, microbial) in the specific product, their relevance for the specific use case of the product, their analytical quantification with suitable methods, the exposure of humans and/or ecosystems to these potentially harmful contaminants during the product use, the calculation of related risks based on exposure and effect (e.g. toxicity, pathogenic potential), and the definition of an acceptable level of contamination to define maximum allowable concentrations of contaminants in the product.
- **Definition of suitable and practicable monitoring and quality control mechanisms** to confirm that products are within the acceptable quality range in relation to potential risks from their use.
- **Lack of capacity and know-how at individual authorities** to collaborate in the complex procedure of EoW applications, especially for risk assessment and related setting of acceptable quality standards (i.e. maximum level of contaminants allowed) for specific products
- **Lack of capacity and know-how at producers** to apply for EoW status of their products, as this involves complex competences on various topics (e.g. chemistry, human and ecotoxicity, material science) and a close collaboration and argumentation with authorities around the comprehensiveness and the outcomes of the risk assessment.

These bottlenecks lead to the situation that getting EoW for a new circular product from water is still seen as a major barrier for business development. The current procedure is time-consuming, costly, requires specific know-how at the company, and its outcome is not predictable for investors and companies. This situation leads to a delay in business development and market uptake of new innovations in the field of CE in the water sector, and also impedes investment into CE innovations from both investors and end-users of the innovations.

Best-practice: the EU Fertilising Product Regulation with harmonised EU-wide EoW criteria for specific fertiliser products from wastewater

As stated above, the only example for EU-wide harmonised EoW criteria for products from wastewater relates to selected nutrient products (e.g. struvite, diammonium sulphate or compost), which are regulated in the EU Fertilising Product Regulation. This regulation defines suitable product functions ("product function categories" or PFC) for fertilising products and related input components as a source ("component material categories" or CMC) which are accepted to produce a defined fertilising product. For each product and use, specific maximum levels of contaminants are defined and they have to be fulfilled to receive a certification (= EC label notified by a certified body) for the EU fertiliser market. A fertilising product which has received this EU certification automatically has an EoW status in all EU member states, thus overruling national or regional regulations for EoW of fertilising products. The EU FPR also regulates the procedures for quality control routine and auditing of the production process and the product.

Still, specific challenges remaining with nutrient-related products from water have been raised by selected stakeholders despite the existing regulation the EU FPR. These challenges relate to the following aspects:

- **Very few notification bodies** are available to conduct the certification following the EU FPR. As an example, no national notification body was found in Germany that offers the related service for certification of struvite. This makes communication and collaboration between applicants and notification bodies very difficult and time-consuming.
- **Costs for regular quality control and auditing** are relatively high in relation to the limited amounts of recovered products in the water sector for a specific production site. For example, the costs for annual audits and related analytical sampling of products typically reach around 6.000€ for a struvite production site. If this site recovers 150 tons of struvite per year (equivalent to a WWTP of 50.000 PE), the costs for audits and quality control will reach 40 € per ton of struvite. This example illustrates how certification costs can be prohibitive for a successful business model, as they can quickly offset potential revenues from struvite recovery and sale.
- **More innovative fertilising products are not yet included** in the current EU FPR, so that they still need a separate EoW application. This includes products from source-separated urine, vivianite recovered at WWTP, blackwater digestate, and products from agri-food waste streams and wastewaters.
- Recovered materials that are brought on the market as a **CMC material still need EoW** in order to sell them to a fertilising company that produces an EU fertilising product. Only CE-marked end-products are automatically given an EoW status. For CMC materials EoW still needs to be achieved case-by-case. If the producer of the CE-fertiliser is in a different country that the producer of the CMC material, EoW has to be established in both countries involved.

3.2 Four potential routes to achieve EoW status

Following the input derived from stakeholder interviews and workshops, there are in principle four different routes that can be followed to achieve EoW status for a product (Table 3). Each route is shortly described and characterized in its current status and challenges:

1) **Harmonized regulation on European level:** this is a convenient route for EoW applicants, because EoW status would be accepted by all members states and regions. An EU-wide EoW status also allows for international transport and trade of the products, which facilitates business development for both tech suppliers of recovery processes and also product marketing in the value chain. The only current example for water-related products is the EU FPR and the specific fertilising products defined in this regulation.
2) **Harmonized regulation on national level:** a defined regulation on national level would also facilitate market uptake of innovative processes and products, but on a more limited market. In addition, cross-border transport and trading would not be possible. Based on stakeholder information, the development of national rules for EoW criteria are currently in progress for a few selected products (i.e. cellulose, struvite) in the Netherlands. Another option on national level is a "legal opinion" by the national authority referring to a specific set of EoW criteria, which is not legally binding but increases trust in these EoW criteria.
3) **Case-by-case decisions**: this is the most common route that is used today to achieve EoW status for a specific product if no European or national rules are available. As discussed above, this route involves major resources both in terms of time, costs and know-how, as both applicants and authorities need to collaborate and agree on a procedure and defined EoW criteria. In addition, these case-specific EoW dossiers are only valid for a defined scope (i.e. product use, product type) and are often not mutually accepted by other regional or national authorities, meaning that a similar case-by-case decision has to be reached for each area of application and each location separately. This process introduces major uncertainty to business development in this field and increases financial risks for investment decisions, as the success of EoW applications cannot be predicted due to a lack of objective criteria.
4) **Self-declaration**: in some member states (e.g. NL, BE, UK, DE), the owner or producer of a product without EoW status is allowed to claim and declare its EoW status based on a dossier that is not officially certified or checked by a relevant authority. This form of "self-declaration" should facilitate and accelerate the process to reach EoW by disconnecting it from general administrative processes in public administration which only count with limited expertise and personnel resources. However, this self-declared EoW status can at any time be legally challenged by a third party at court (e.g. by any public authority or inspector, but also by a competitor on the market). In addition, the procedure and methods to follow when setting up such a self-declaration are not defined at all, which again leaves the applicant with the tasks of developing own EoW criteria which could potentially hold against legal challenge. Overall, self-declaration may be the fastest way to reach EoW for a new product, but it introduces an even higher level of risk into business development as it could be challenged at any time, and no procedure is established to check the quality and robustness of these EoW claims. Authorities may support self-declaration by producing a legal opinion of ruling on these claims.

Table 3: Characteristics of different routes to achieve EoW status for circular products from water

Route	Harmonized regulation on EU level	Harmonized regulation on national level	Case-by-case decisions	Self-declaration
Territorial scope	EU	Member states	National or regional	National or regional
EoW criteria	Defined	Defined	To be developed by applicant and authority	To be developed by applicant
Advantages	Clarity on EoW criteria, international trade and transport	Clarity on EoW criteria, access to national market	Can be started by any applicant, no political support required	Autonomous process by applicant
Challenges	Extensive stakeholder process to prepare regulations, political support on EU level required	Political support on national level required, group of stakeholders with common interests needed	Need of expertise at applicant + authority, uncertainty in outcome, long process	Need of expertise at applicant, legal uncertainty
Examples	EU Fertilising Product Regulation	None for circular products from water*	Cellulose, CO_2, Struvite	?

** National regulation for cellulose under preparation in NL*

System of quality assurance

For all four routes, the responsibility for establishing and operating a certified quality control system at the production site remains entirely with the producers and owners of a circular products. This involves additional costs, but also a new mindset at production sites (i.e. WWTP) where the operators are typically not used to produce a "product" and regularly check its quality and conformity to a certain standard. This is another challenge in implementing EoW criteria for products from wastewater and needs further attention and qualification of the personnel involved.

4.0 CURRENT INITIATIVES FOR IMPROVEMENT

4.1 European activities in EU-wide harmonisation of EoW criteria

Current process of JRC to harmonize EoW criteria

The JRC is responsible for facilitating and leading the process to develop technical proposals for EU-wide harmonisation of EoW criteria for waste-derived products, thus providing the basis for related regulations on European level. According to direct information from JRC experts working on this task (L. Egle, JRC Sevilla), this process typically involves multiple rounds of workshops and exchanges with a wide range of stakeholders (Figure 3). This "Sevilla process" typically takes 1,5-2,5 years to develop a non-binding technical proposal, which will then be directed to the EC as a basis for setting up new regulations.

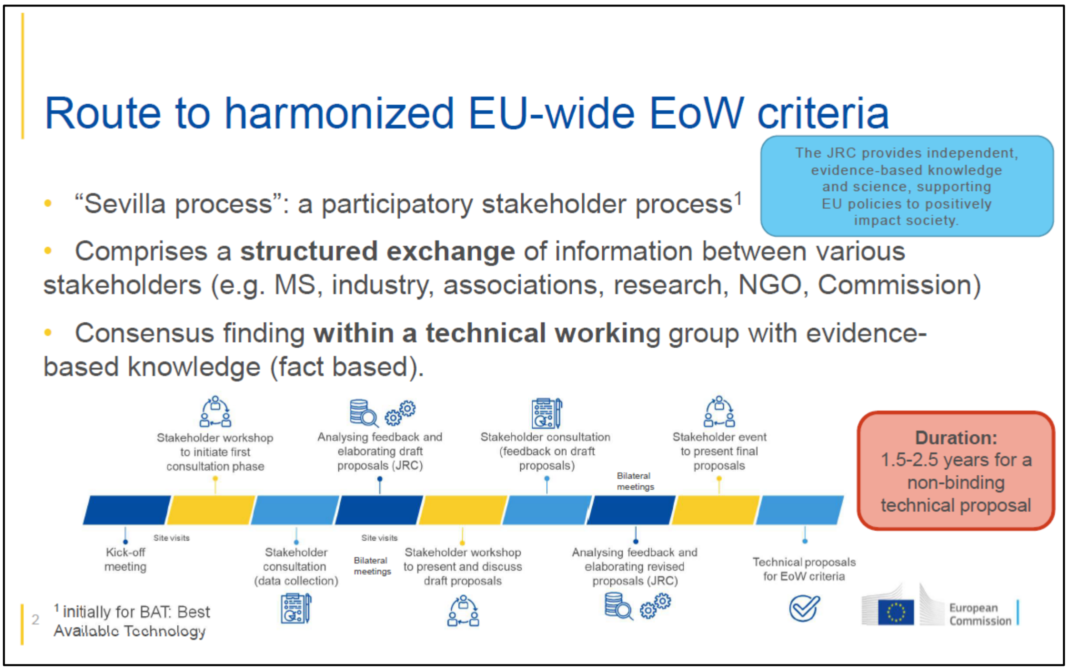

Figure 3: Route to develop EU-wide harmonized EoW criteria ((C) JRC – L. Egle)

In principle, this process is also suitable to derive EU-wide harmonised EoW criteria for water-related products. However, the latest scoping study of JRC has concluded that water-related products have a relatively **low priority** to be selected for this process (Figure 4). This is mainly due to their low volumes compared to other waste-related product streams (e.g. plastics, textiles) and the targeting of specific niche markets. For some products, a real market demand may not even exist at this moment, as they address new types of products and product uses that have not been established so far. In addition, there is a lack of national regulations for EoW criteria for these streams, which would be a pre-requisite to underline the interest of these member states in EU-wide harmonisation.

JRC is currently working on a number of waste-relate products (e.g. plastic waste, textile waste, construction waste) to deliver technical proposals for harmonised EoW criteria. Due to the low priority of water-related products, it is not expected that an official process for developing respective EoW criteria for them will be started soon due to limited resources, but also due to the limited political support of these products on EU member state level or within the European Commission.

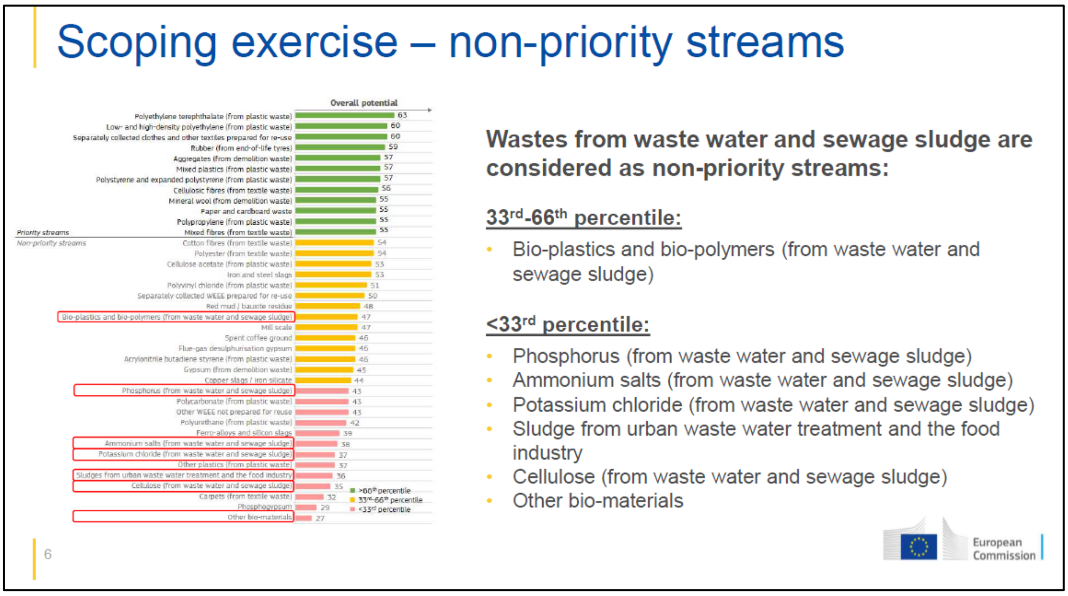

Figure 4: Low priority of water-related products for developing EU-wide harmonised EoW criteria ((C) JRC – L. Egle)

Outlook on developing EU-wide harmonised EoW criteria for water-related products from JRC perspective

According to JRC experts, a development of EU-wide harmonised EoW criteria for circular products from water is unlikely to be reached in an EU-funded project such as BOOST-IN, as this process requires both major resources and extensive collaboration with a wide range of stakeholders, which is expected to be beyond the capacities of the project. However, preparatory work within BOOST-IN would be helpful for JRC to take as a starting point for future tasks in this direction (i.e. once the political will is reached on EC level to develop harmonised EoW criteria for water-related products). This preparatory work could include:

- Collecting general information and data about new products
- Defining potential fields of use
- Defining typical product characteristics (parameters and ranges)
- Collecting analytical data on potentially hazardous contaminants to humans and/or ecosystems

This preparatory work will help JRC to start the process, and also to identify relevant stakeholders and experts for these products to be involved in the consultation process.

Supportive work of European organisations

The lack of suitable EoW criteria for water-related products has also been recognized as a major barrier for innovation by European organisations such as EUREAU (European Federation of national water associations, www.eureau.org) and ESPP (European Sustainable Phosphorus Platform, www.phosphorusplatform.eu). This led to a joint letter to the EC (ESPP, 2021), calling for inclusion of water-related products into the scoping of the JRC report on potential candidate streams to develop EU-wide harmonised EoW criteria. To underline this claim, specific fact sheets have been produced by EUREAU that summarize the need for EoW criteria and specific information related to product type, recovery process, market potential, and environmental and quality aspects (EUREAU, 2021). The factsheets cover the product types “minerals” (e.g. inorganic nutrient salts and compounds), “algae biomass” (e.g. bioplastics, lipids, proteins, fatty acid), and “fibres, polymers and other substances” (e.g. cellulose, EPS, biochar). Following this request, selected waste streams were included in the scoping study of JRC (Orveillon et al., 2022), but this supportive work did not yet lead to development of specific EoW criteria on EU level. However, the existing factsheets can build a very good starting point for future activities in this field.

Activities of the sister project CIRSEAU

The task of promoting harmonised EoW criteria for water-related products is also part of the sister project CIRSEAU. The respective work is led by IWW (K. Wencki) in collaboration with EUREAU (S. Mouret), who have both contributed to expert and public workshops of BOOST-IN. Within the CIRSEAU project, it is planned to conduct a gap analysis of the regulatory framework at national and EU level and formulate a roadmap for the development of EoW criteria as a guiding document, which would perfectly integrate with the results of BOOST-IN, showing a successful collaboration of these two projects. This process should clearly identify the needs of the sector and develop a roadmap together with relevant stakeholders and member states experts in EoW criteria. It will also analyse and compare national procedures and approaches to identify success stories and current best practice.

4.2 National activities: development of self-assessment tool in NL

As many companies and investors still see the lack of EoW criteria as a barrier for circular business, a group of interested stakeholders from the Netherlands has started a joint activity to tackle this aspect. Based on a research study funded by Invest-NL and GCNE (Mense et al., 2023), they have identified that the self-assessment route could be an important route to overcome the current barrier. However, clear guidance of how to conduct a robust self-assessment is still lacking for the sector.

Therefore, a follow-up project has been started by this group to develop a method and tool for self-assessment that enables companies to conduct this self-declaration in a structured and feasible way. A focus has been the method for risk assessment, as this EoW criterion is often the most challenging part for the applicants.

The self-assessment tool will contain four components:

1) General guidance for the self-assessment and required resources
2) Step-by-step plan for self-assessment
3) Route selector for different types of risk assessment
4) Four different routes for detailed procedures of risk assessment

The development of the tool is on-going, while the first conceptual design and work flow has been drafted and discussed with relevant stakeholders (Figure 5). A key area for method development is the risk assessment part, for which different routes are proposed depending on the level of know-how of the potential contaminants in the product and the related application type and its requirements.

The project will continue in the coming years, also involving international stakeholders from the sector.

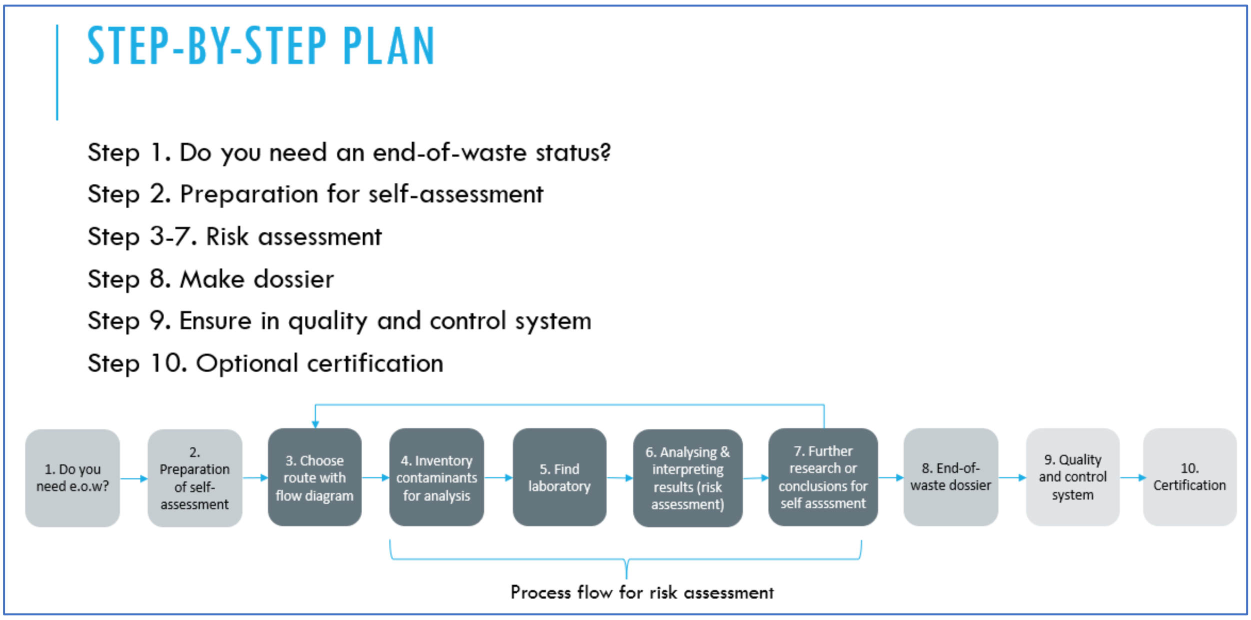

Figure 5: Concept for step-by-step plan for self-assessment towards EoW criteria ((C) AquaMinerals)

4.3 Enabling political frameworks

The lack of EU-wide harmonisation of EoW criteria for water-related products can only be overcome if the political mandate is expressed by the EC and its member states. Therefore, enabling political frameworks for circular economy are decisive as they define the overall policy goals and thus lead to concrete actions in their implementation.

A major framework is the upcoming **Circular Economy Act** as an important political initiative towards a more circular economy, which is expected for 2026. This initiative aims to reshape how industries utilize resource and manage waste, promoting a more sustainable and circular approach to production and consumption. It builds upon the Circular Economy Action Plan (CEAP) and intends to reduce reliance on external resources, boost domestic recycling and recovery, and position the EU as a leader in sustainability. It can be expected that the act will also tackle the existing barriers of EoW application for new products, especially for innovative low-volume markets and thus also for the water sector.

A window of opportunity for nutrient-related products is the **review of the current Fertilising Product Regulation**, which is currently executed by the EC. It is foreseen that the product and component categories will be extended to include new input streams and potential products to be included in the FPR, thus receiving automatic EoW status in case of successful certification. An on-going study by NMI Agro (NL) for the FPR review explores potential new input materials such as vivianite, human urine/excreta, secondary limes, recovered nitrogen and potassium salts, algae and plants grown in wastewaters, industrial sludges, and more.

5.0 CONCLUSIONS

5.1 Summary of current situation and initiatives

This report summarizes the experiences and lessons learned for the current status and on-going initiatives related to EoW criteria for water-related products. It builds upon a review of reports, stakeholder interviews and expert workshops.

The current situation can be summarized as follows:

- Achieving an EoW status for new circular products from the water sector is still a **major challenge for companies**, and is seen as a **barrier for business development**.
- **EU-wide harmonisation** of EoW criteria for water-related products currently has a **low priority** in the related work of JRC. Preparatory work in data collection would be useful for future activities of JRC in this respect.
- Harmonised EoW criteria are available for selected nutrient-related products in the **EU Fertilising Product Regulation**. However, related certification costs and administrative burden are still challenging business models for low-volume production sites.
- Due to the lack of EU-wide harmonised EoW criteria, **case-by-case decisions** are still the standard for companies. This complex process typically takes several years, comes with high costs for applicants, requires specific expertise by applicants and regulators, and is also impeded by a lack of capacity at relevant authorities. A **major bottleneck is the risk assessment** for humans and ecosystems and the associated definition of acceptable levels of contaminants in products. This leads to high uncertainty and risks for investors and business development for circular products.
- **Self-declaration** of EoW status without a legal rule or opinion by authorities is an option, but the process is difficult to pursue for smaller companies and the outcome can be legally challenged. On-going initiatives develop **guidance and tools for efficient and practicable self-declaration**, especially for the challenging field of risk assessment for new products and use types.
- The upcoming **Circular Economy Act** and the review of the **Fertilising Production Regulation** are expected to be enabling political frameworks to promote further harmonisation and facilitation of the EoW applications also for water-related products.

5.2 Recommendations for next steps

From the extensive discussion and exchange with relevant stakeholders and EoW experts, the following actions were formulated to improve the EoW challenge and enable wider market uptake of circular products from the water sector:

- **Share know-how and experience of EoW challenges and solutions** in EU network (for both applicants and authorities)
- **Adapt existing regulations** (e.g. FPR) to needs of the CE in the water sector
- **Define methods for risk assessment** with clear framework and procedure
- **Promote mutual recognition** of EoW dossiers between authorities or even member states
- **Build political support for water products** to put EoW criteria on the agenda for harmonisation, especially within the European Commission regarding its political priorities
- **Share costs of applications** between parties

For the second period of the BOOST-IN project and considering the available resources, the following activities are planned:

- **Continue the exchange** with the established stakeholder network
- **Start a platform for collaboration**, exchange and know-how transfer for EU stakeholders working on EoW for water-related products
- **Collect information and data** on water-related products and related EoW criteria to prepare future harmonisation of EoW criteria on a European level
- **Support on-going initiatives** for improving EoW procedures (e.g. self-assessment tool in NL)
- **Contribute to policy recommendations** for upcoming policy frameworks (e.g. Circular Economy Act)

These steps will help to further build political support for harmonisation of EoW criteria for circular products from the water sector and to overcome a major barrier for successful market uptake and business development in this field. The final outcome of these activities will be reported in Deliverable 3.5 at the end of the project.

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The quantity and quality of water resources are serious problems in many European areas, mostly being a joined result of climate change and anthropic influences. The BOOST-IN project aims to develop a successful strategy that promotes technological changes, governance schemes, shifts in mind-set and organizational structures to solve these problems through a better management of the water sector and application of the circular economy principles, enabling water reuse and recovery of different materials (e.g. energy, nutrients). However, implementation of these changes still faces several barriers (e.g. technology, economy, knowledge, social perception) that need to be overcome. BOOST-IN will achieve these goals by an effective identification, selection (through a specifically designed dynamic funnel method) and transfer of innovative Water Circular Economy Solutions (WACES) to further close and improve the water cycle.

The project will develop and apply its approach in six Regions of Opportunity evenly distributed across Europe (Spain, Greece, Germany, France, Italy and Bulgaria) by organization of co-creation workshops to increase public awareness and support for WACES implementation, barriers overcoming as well as by the specific risk management plans design.

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