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THE TACIT END-OF-WASTE STATUS IS de facto USED IN THE EU AND CRUCIAL FOR THE CIRCULAR ECONOMY

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ABSTRACT

For a well-functioning circular economy, recovered materials with a specific purpose, that have a market, and meet the legal requirements for both products and the environment should have a product status. However, at EU level, EoW has only been established for certain metals and cullet glass, and implementation at national level has slowed down. One potential solution is tacit EoW, supported in our opinion by articles 6(1) and 6(4) of the Waste Framework Directive (WFD), which can be understood as placing responsibility on economy operators with possible oversight by authorities. Such an interpretation is not currently accepted by the authorities in most European countries, where a formal "case by case" authorization is at least required. This position paper examines the status of various waste streams in the EU and illustrates that tacit EoW is already widely used (1 billion of tonnes?) in regulation and waste management practices. This includes: Reuse of material as a product after preparation (level 2 of the waste hierarchy); Recycling of materials (level 3 of the waste hierarchy) to produce new products; Recycling in environmental applications, such as fertilisers, soil conditioners, and growing substrates, as well as road basement and backfilling operations; Energy production from various biomass and wood waste categories. Granting tacit product status consistent with level 3 of the waste hierarchy to other materials processed by certified industrial facilities would benefit the circular economy. Ten materials ranked by the EU Joint Research Centre could immediately benefit of tacit EoW.

1. THE IMPLEMENTATION OF THE END-OF-WASTE PROCEDURE

The advantages of EoW status are greater use of recycled materials in products (with certified quality) and therefore less new consumption (energy, raw materials, oil, water, etc.) and fewer emissions (waste, CO_2, used water ...) while increasing EU's strategic autonomy.

Not only the recycling industry asks for that status but also the producers. To reflect the whole value chain perspective, in a document "*No time to waste: EU-wide end-of-waste criteria for recycled rubber from tyres"* (EuRIC and ETRMA 2022), it is stated that "*Today, rubber circularity from end-of-life tyres (ELT) is at stake, and the tyre value chain (from producers to recyclers) is ready for taking this step at EU level right now*." (Figure 1).

The Waste Framework Directive of 2008 revised in 2018 (EU 2018) defines criteria for end-of-waste status: existence of commonly used specific applications, existence of a market or a demand, fulfilment of technical requirements for the specific applications (meeting existing legislation and standards applicable to the products the waste streams substitute), and the absence of any overall adverse environmental or human health impacts in the intended use.

According to many authors, the process of regulatory EoW has halted or at least slowed down since 2016. A review is presented in (Hennebert et al., 2024a), and the reasons are: *"... excessive slowness, excessive precautionary principle, a part of arbitrary commission "expert" judgment who's some can be opposed to, delegation to local authorities that have not always the expertise, single waste by single waste approach with individual (small business) demanders that have not always the resources for best quality dossiers*".

Twenty-seven years ago, before the Waste Framework Directive of 2008, the need for inclusion of resource in the definition of waste was already stressed (Bontoux and Leone, 1997; Pongrácz and Pohjola, 1997). The experts of EU Joint Research Centre (JRC) proposed a distinction between waste and non-waste (Bontoux and Leone, 1997). The JRC provides independent, evidence-based knowledge and science, supporting EU policies to positively impact society (EC, 2024). The JRC did many propositions since

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FIGURE 1: Key benefits of EU-wide end-of-waste for recycled rubber from tyres (European Recycling Industries' Confederation - EuRIC and European Tyre & Rubber Manufacturers Association - ETRMA 2022).

1997. In a report on end-of-waste criteria for waste paper: "*The Directive introduces the possibility that certain waste streams having undergone a recovery operation and fulfilling certain criteria – so-called End-of-waste criteria – can cease to be waste*. "(Villanueva and Eder, 2011). In a report on end-of-waste criteria for biodegradable waste subjected to biological treatment (compost & digestate): "*The purpose of end-of-waste criteria is to avoid confusion about the waste definition and to clarify when certain waste that has undergone recovery ceases to be waste. Recycling should be supported by creating legal certainty and an equal level playing field and by removing unnecessary administrative burdens*." (Saveyn and Eder, 2013). These suggestions have been included as unsaid end-of-waste in the Fertiliser Regulation 1009/2019/EU (EU 2019). In a report on end-of-waste criteria for waste plastic for conversion: "*The purpose of end-of-waste criteria is to avoid confusion about the waste definition and to clarify when certain waste that has undergone recovery ceases to be waste. Recycling should be supported by creating legal certainty and an equal level playing field compared to virgin material production, and by removing unnecessary administrative burdens. The end-of-waste criteria are defined as to provide a high level of environmental protection and an environmental and economic benefit to the recycling chain of the material under study*." (Villanueva and Eder, 2014). In a report of JRC of 2022 ranking priority of different waste streams for EoW status, "*This study supports the implementation of both the Circular Economy Action Plan and the Waste Framework Directive by identifying a list of priority waste or by-product streams (scoping) and deriving the most suitable candidate streams for which to develop further EU-wide end-of-waste or by-product criteria*." (Orveillon et al., 2022).

On the other hand, a more liberal approach, rooted in responsibility, self-regulation, and a risk-based strategy, encourages reuse and recycling (Hennebert et al., 2024a). Striking the right balance between a centralized precautionary stance ("The administration rejects due to potential hazards to people and the environment...") and a decentralized approach that promotes industry-led, risk-conscious solutions for reuse or specific applications in secondary materials is a pressing question. In a report for the European Commission (EC, 2020), the German Federal Environment Agency and ARCADIS Belgium proposed that the economic operators take the responsibility of the end-of-waste status, without prior approval by the authorities, and with ex-post control if necessary: "*Simplifying certain aspects of the decision-making process by referring to the 'ex-post' assessment of the EoW decisions taken by the economic operators*." (p. 131).

Different solutions to circumvent/solve the halting of EoW were proposed: "*non-waste*", "*waste use potential*", "*certified material*", "*non-waste product*", "*secondary raw material*", "*premat*" (synthesis in Hennebert et al. 2024a). In any case, creating a third category between waste and product is legally and practically unfeasible. The best option seems to move from waste to product status by a "tacit" end-of-waste procedure.

A more demanding solution can be considered: "*We argue that in a longer-term perspective the aim should be to erase the border between waste and chemicals regulation and create a single regime for the regulation of materials and their flow*" (Alaranta and Turunen, 2021). However, simultaneously advocate additional transitional precautionary measures, without any specific arguments of effective circulation of toxic substances. Matter beneficiating of EoW procedure are products (articles or preparation and substances). The product regulation is continuously updated and more stringent. In name of potential hazard and risk (probability or frequency of exposure and damage of a target by hazardous substances in the intended use), the authors are in effect jeopardising their "*longer term perspective*".

Recycled materials fulfil specifications (under the responsibility of the producer) to be sold. These materials actually become products when used by the buyer.

Examples are old papers, metal scraps, garden and hedges materials. This procedure happens without ex-ante control or administrative authorization. It is in fact a tacit EoW procedure.

The objective of this position paper is to show that tacit EoW is in fact already very widespread for hundreds of millions of tonnes of materials in the EU. To demonstrate this, it is necessary to broaden the scope and include combustibles, fertilizers, road foundations materials, contaminated soils, technosols, even fumes and treated water. The whole image then becomes obvious and the horrible notion of waste destined to be landfilled (far from consumers) weakens. The main point of this paper is that hundreds of millions of tonnes of materials are managed by specific regulations equivalent to EoW or by unsaid tacit EoW. It should be understood and recognised as such and applied to other resources streams.

The interpretation that articles 6(1) and 6(4) of the Waste Framework Directive (WFD) can be understood as placing responsibility on economy operators with possible oversight by authorities is not currently accepted by the authorities in most European countries, where a formal "case by case" authorization is at least required. For the proposed interpretation to become generally accepted, a modification of the WFD or clear Guidelines from the Commission should be necessary.

2. WHAT SHOULD BE THE TACIT EOW PROCEDURE?

The law "for the green industry" in France in 2023 (FR 2023) gives to the products of production facilities made from waste an end-of-waste status (with the same conditions as in the Waste Framework Directive) without prior approval by the administration, that can ex-post control their actions, including on requirement of NGOs or industries.

The proposition of the German Federal Environment Agency and ARCADIS Belgium (EC, 2020) and the French law are in line with the Article 6(1) of the WFD (EU, 2018) which states: " *Member States shall take appropriate measures to ensure that waste which has undergone a recycling or other recovery operation is considered to have ceased to be waste if it complies with the following conditions…* " and in line with the Article 6(4) which states: " *Where criteria have not been set at either Union or national level under paragraph 2 or 3, respectively, a Member State may decide on a case-by-case basis, or take appropriate measures to verify, that certain waste has ceased to be waste on the basis of the conditions laid down in paragraph 1…":* "verify that certain waste has ceased to be waste" means that the regional producers or a single producer can claim the end-of-waste status and the authority checks whether the conditions are met. In our opinion, ex-post decision making would fall under the category of appropriate measures of articles 6(1) and 6(4). This is not the present legal situation as explained above.

The European Recycling Industries' Confederation (EuRIC) pledge for a tacit end-of-waste status of recycled matter at the exit of certified industrial facilities (EuRIC 2019, 2020, 2022, 2023, Hennebert et al., 2024a).

This question is open to discussion since 2017 during the consultation on Chemical, Product, Waste interface (EC, 2017). The European Consumer Organisation BEUC pledge for an active monitoring and control: "*We call on the Commission, in cooperation with Member States, to ensure that only safe recycled materials of known quality is placed on the market. … For this reason, robust end-of-waste criteria that strike the right balance between encouraging recycling and avoiding re-injecting hazardous substances into the economy are required*" (BEUC, 2017).

The tacit EoW should apply at EU level: "*The difference in national EoW criteria imposes unequal costs on [end-of-life tyres] ELT recyclers, depending on the testing requirements of the national criteria. Some countries have more stringent requirements for chemical testing of batches whereas others do not. The lack of alignment and absence of EoW criteria in some Member States also leads to issues with exports from the EU: those Members States with ELT EoW criteria are able to export ELT as a product without the need to comply with waste shipment regulations and hence have a competitive advantage*." (EuRIC and ETRMA, 2022).

2.1 The case of hazardous waste

Removing waste status results in fewer administrative constraints, particularly for hazardous waste, which must be closely controlled. Hazardous means for waste that the limits of one or more of the 15 hazard properties HP 1 to HP 15 and the POP concentration are exceeded (summary in Hennebert, 2019). With a calculation method close to the one of products, 50% of the hazardous waste are hazardous by ecotoxicity HP 14 'Ecotoxic' and 20% are toxic for humans HP 6 'Acute toxic' (Hennebert et al., 2016).

Non-hazardous waste is neither explosive nor oxidizing nor combustible (test of flame propagation speed) nor toxic for humans nor ecotoxic nor POP. It therefore does not present any risk whatever the use. Whether non-hazardous materials leaving recycling facilities circulate under waste status or under product status is ultimately only of administrative importance.

Hazardous waste must be used only for defined purposes so that the risk(s) for humans and the environment are acceptable. These hazardous materials leaving the recycling facilities will circulate under publicly tightly controlled waste status (including the waste tracking slip). In the event of end-of-waste status, these materials will circulate under the more self-controlled status of product. It is therefore logical and necessary that the EoW declarations or authorisations for hazardous waste are more subject to control by the administration, as provided for by the law "for green industry" in France in 2023 (FR 2023).

3. TACIT EOW FOR DIFFERENT CASES OF REUSE AND RECYCLING

This section presents different cases of reuse and recycling, and the tacit status of associated waste. The different cases are presented at Figure 2.

In the WFD,"*"material recovery" means any recovery operation, other than energy recovery and the reprocessing*

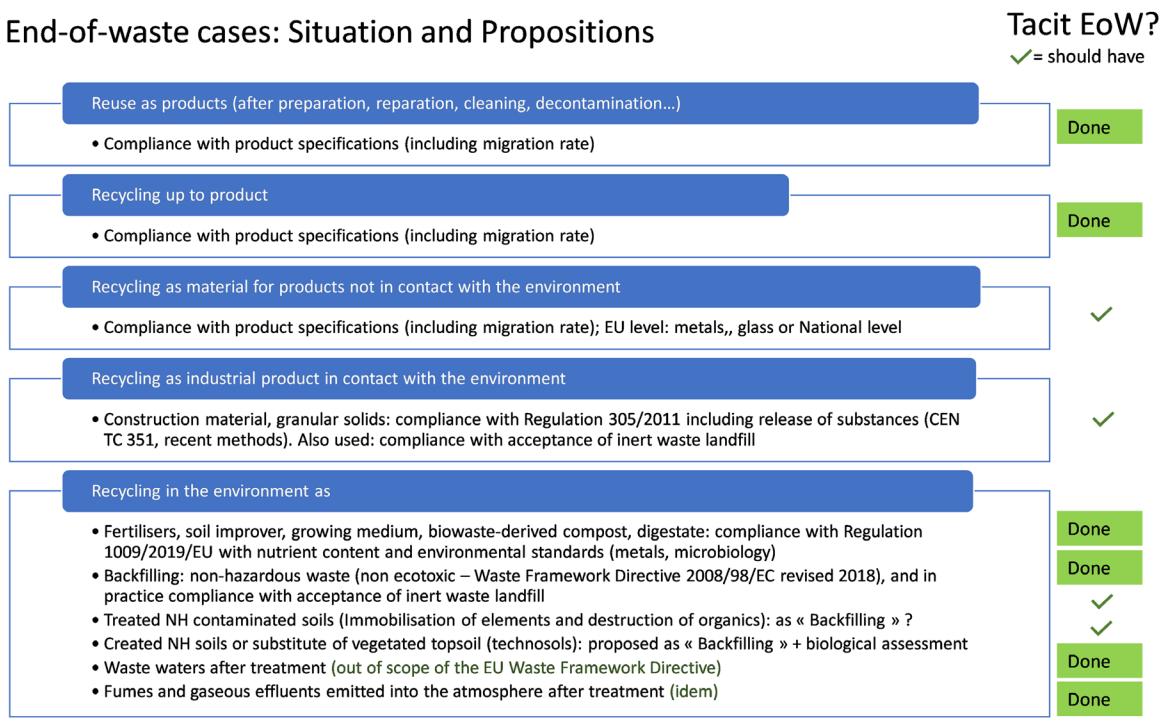

FIGURE 2: Different cases of reuse and recycling, and the tacit status of associated waste (NH = non-hazardous).

into materials that are to be used as fuels or other means to generate energy. It includes, inter alia, preparing for re-use, recycling and backfilling" and *""backfilling" means any recovery operation where suitable non-hazardous waste is used for purposes of reclamation in excavated areas or for engineering purposes in landscaping. Waste used for backfilling must substitute non-waste materials, be suitable for the aforementioned purposes, and be limited to the amount strictly necessary to achieve those purposes"*. So, material recovery includes preparation for re-use, recycling, backfilling and other operations excepted fuel or energy production.

3.1 Case of re-use as product after preparation

For objects or materials that are reused (eventually after cleaning – e.g. textile or after industrial decontamination – e.g. active coal), the compliance with the specifications of the corresponding product is fulfilled. It is in fact a tacit end-of-waste procedure.

3.2 Case of recycling up to products

This case is the recycling (separate collecting, sorting, cleaning, eventual first transformation) of material from waste as raw material for new product. It is similar to 3.1.

3.3 Case of recycling as material for products not in contact with the environment

For "waste" (resources) that are recycled into industrial or consumer product not in contact with the environment, the compliance with the specifications of the corresponding product will be achieved and is legally sufficient. Due to legislation on products and protection of environment and human health, the products normally have no adverse effects on health or the environment under their recommended use. These wastes can be hazardous in the sense of the waste hazard classification. The intended use will limit the exposure and hence the risk. For example, for plastics and textile fibres, some additives make the plastic hazardous when they are used at their functional concentrations. From 233 additives, it has been found that 63 additives at their functional concentration (= 27% of 233) make plastic hazardous (Hennebert, 2023). Substitutes are most of the time available. The principle of essential use (use only when no alternative is available) should be promoted. Specific methods and tests for each material and each use have been developed. For instance, the migration rate is defined in product regulations.

For end-of-waste criteria, compliance with the specifications of the corresponding product is legally sufficient. The products normally have no adverse effects on health or the environment under their recommended use. It could be not necessary to develop specific methods and tests. For products not in contact with the environment, specifications elaborated by the producers are available and the recycler "only" has to comply. Consequently, tacit EoW status should be granted for materials sold at the output of certified recycling facilities (EuRIC, 2023; Hennebert et al., 2024a).

3.4 Case of recycling as product in contact with the environment

A risk assessment on end-of-waste criteria is justified in the event of use in contact with the environment. There are already, for example, specifications for building materials in Regulation 305/2011 (EU 2011), developed in CEN TC 351 (Construction products: Assessment of release of

dangerous substances). The concentration limits in solid and leachate used for acceptance into inert waste landfill, without any impermeable barrier (Decision 2003/33/EC, EC 2003) are widely used for different materials in contact with the environment. A leachate means in this context the initially deionised water that has passed through a column of material (percolation test) or that has been in contact with the material (batch leaching test), that is filtered, and analysed.

How were obtained the leachate concentrations used for acceptance into inert waste landfill (EC 2003)? The method includes an integrated model of emission of elements and some compounds by waste, the vertical transport of these contaminants through the unsaturated soil layer by vertically draining water and their interaction with that soil. This is followed by mixing and horizontal transport and adsorption/desorption within the saturated zone by horizontally moving ground water (Hjelmar et al., 2001; Hjelmar, 2012; Hennebert, 2022). The principle is that from the release of contaminants in leachate from a waste (by column percolation tests), the expected concentration at the point of compliance can be assessed. Using the target concentration of elements and substances in the groundwater, the corresponding maximum leaching concentration of elements and substances from waste can then be calculated by "reverse modelling". The target concentrations in the groundwater are typically the ones for water that can be made drinkable or the ones of drinking water of the World Health Organization or of the EU. It is a risk approach: the maximum leachable concentration derived from reactive transport reverse modelling from waste, based on published parameters for modelling. That method was used for the case of mercury in non-sulphidic mine tailings and was successfully proposed to the COP4 of the Minamata Convention 'Make mercury history' (Hennebert, 2022).

Demonstrating that a recycled material in contact with the environment does not harm the environment (a condition for EoW status) is in many cases much more demanding than simple control that the specifications of a product are met. It's a logical scientific question: demonstrating no action(s) requires more data than demonstrating an action. If no action is taken, all cases of cause and effect must be documented. For a specific action, fewer cases need to be studied. Long-term studies (years) are sometimes necessary and fully justified to assess that the use is not harmful.

3.5 Case of material recovery in the environment as beneficial substances for soils, backfilling, treated contaminated soils and sediments, technosols

The biowaste-derived compost, and methane digestate benefit of a tacit EoW, after an exhaustive study by the JRC, if they comply with Regulation 1009/2019/EU (EU 2019) with nutrient content and environmental standards (metals, microbiology), together with the (primary) fertilisers, soil improver and growing medium. The backfilling (Waste Framework Directive 2008/98/EC revised 2018) as recovery operation of non-hazardous waste is allowed since 2018 and in practice is a case of EoW status. Most of the time, compliance is verified with acceptance into inert waste landfill (EC 2003).

The treated non-hazardous contaminated soils and sediments (immobilisation of (eco)toxic elements and destruction of (eco)toxic organics), and the man-made non-hazardous soils or substitute of vegetated topsoil (technosols) could be treated as backfilling.

A clear EU framework for the evaluation of the biological functionality of these soils and sediments is lacking. How to assess the biological impact of the intended use in natural environment? And what is the acceptable concentration of elements in the leachate or the effect in a laboratory biotest? Some authors of biotests de facto look for a zero effect whatever the dose. When wastes are used in soil as an amendment, conditioner or fertilizer, it must be recognized that the relevant concentrations in the leachate or effects in biotests at agronomic rates are not the zero concentration or effect, but rather the concentrations or an effect comparable to those of agronomic rates of amendments or fertilizers used in agriculture for a long time. For example, clean wood ash at high levels will be phytotoxic in itself due to alkalinity, but at the recommended dose of ±1 litre/m² (0.25 kg/m²) it is a sustainable source of alkalinity, potassium and phosphorus.

Another point is that it is important to promote the recycling of N, P, K, Ca, Mg, S and trace nutrients Fe, B, Mn, Zn, Cu, Mo, Ni, etc. from waste, taking into account the entire life cycle of industrial waste production. For N, P, K, the offsets are oil or natural gas consumption, extraction of phosphate rock and attack with sulfuric acid, with some African ores too rich in cadmium, mining kainite and sylvinite and purification with enormous piles of NaCl salinizing for instance the Rhine valley in Alsace (FR) on the one hand, and the harms of non-cycling on the other hand: either incineration/combustion (energy for drying, air pollution control residues and ashes to be landfilled, unlimited legacy of landfills for the next generations), or direct landfill (methane emission, space consumption, illimited legacy). Life cycle analyses are the best method to consider the global advantages and disadvantages.

The fate of wastewater and gaseous effluents, which do not have waste status in the WFD, but which are released into the environment after treatment and in compliance with concentration and flow limits, is a sort of tacit status of EoW.

3.6 Summary of EoW cases

The different cases are sketched in Figure 2.

4. TACIT EOW STATUS FOR NON-HAZARDOUS MATERIAL IN CONTACT WITH THE ENVIRONMENT: THE CASE OF MSWI BOTTOM ASHES FOR ROAD FOUNDATIONS IN FRANCE SINCE 1994, AND 5 OTHER MINERAL NON-HAZARDOUS MATERIALS IN FRANCE

The French Circular of 1994 relating to the elimination of incineration bottom ash of municipal solid waste incinerator (MSWI) from urban waste defined the

conditions to valorise the bottom ashes in road, parking and construction basements. It can be assessed with the EU 2018 criteria for EoW status (Hennebert, 2024b). The Circular anticipated the four conditions for EoW:

a) Specific purpose
   i. The Circular defines the uses as road, parking or construction basement
b) Existence of a market or demand
   i. Evidence at the time of the Circular. In 2020 in France, 2.4 Mt/year were maturated and valorised (from 13 Mt/y of municipal solid waste generating 2.7 Mt/y bottom ashes) (ADEME, 2022)
c) Fulfilling of technical requirement
   i. Three categories of BA are defined in the Circular: recoverable, maturable and storable, depending on regular analyses, by a tier or by the operator, with leaching concentration limits for classification. Recommendations are formulated for initial characterisation and for periodic sampling. The report on the initial characterisation must be communicated to the Inspection of classified installations. The environmental assessment was later completed with geochemical modelling (Bellenfant and Guyonnet, 2009) and percolation tests and lysimeters studies (CEREMA, 2015).
   ii. Maturation platforms are installations classified for environmental protection. The BA must be recoverable after a maximum of 12 months, otherwise it is landfilled in landfills for non-hazardous waste. Traceability of the different batches in the platform is mandatory.
   iii. A quality protocol is recommended. If it exists, it should be transmitted to the Inspection of classified installations.
d) Absence on adverse effects in the intended use
   i. Intended use with a protective layer, in controlled conditions, not in the perimeter of production of drinking water, at least 30 m away from any watercourse and at an altitude 1 m higher than the highest known level of waters in the area.
   ii. The analytical methods (leaching in 3 times 10 litre/kg, the French leaching test at that time) and the concentration limits were defined in the Circular to minimise emissions and transfer to groundwater.

As the Circular requests that the producer samples and analyses by himself or by tier independent laboratory: "*It is not the responsibility of the inspection of classified installations to certify the quality of the bottom ash produced by an installation. It is up to the operator to be able to demonstrate to users of the bottom ash it produces that the recovery conditions set by this text and the authorisation order which governs the operation of its installation are respected*", it was the first legal document establishing de facto a tacit end-of-waste procedure.

That tacit EoW was reinforced in 2011 by a Guidance document of a public technical institute aligning with the Decision 2003/33/EC on landfill acceptance criteria for inert waste (CEREMA, 2011), with a tiered approach of European batch leaching test, percolation test (CEREMA, 2011), completed in 2015 for the level 3 of environmental characterisation with lysimetric tests and experimental plots (CEREMA, 2015) and updated in 2023 (CEREMA, 2023).

That method was applied in dedicated guidance on steel slags (CEREMA, 2012a), bottom ash from non-hazardous waste incineration (CEREMA, 2012b, an update of the 1994 Circular), on deconstruction materials from building and public works (CEREMA, 2016), on foundry sands (CEREMA, 2019a) and ashes from pulverized coal-fired power plants (CEREMA, 2019b). That institute also managed research and development works on the valorisation of marine and land sediments in public works and concrete.

For total mineral non-hazardous waste, in 2020 in France, 130 Mt were recycled (backfilling non included), as road basements or granulates for non-structural concrete. These tacit end-of-of-waste procedures have contributed to that result. That fact illustrates that EU-wide tacit end-of-waste status should be granted for the materials supplied by certified industrial recycling facilities.

5. TACIT EOW AND SPECIFIC COMBUSTION REGIME FOR COMBUSTIBLES

The use of waste for thermal energy is particular since it involves products and waste: agricultural and forestry products are also used for this purpose, and the energy recovery of waste in principle only concerns waste that are not recyclable as material (level 4 of waste hierarchy).

The combustibles (solid, liquid, gaseous) include (seeTable 1):

- products,
- waste with effectively tacit (unspoken) EoW,
- waste without EoW (in France) but with a special combustion regime (Solid Recovered Fuel also named Refuse Derived Fuel),
- non-hazardous and municipal waste excluded from EoW status, and
- hazardous waste excluded from EoW status.

The categories of biomass that are waste (EU, 2015), namely vegetable waste of agriculture and forestry, of food processing industry, of paper production, of cork, and wood waste without halogenated organic substances and heavy metals, benefit of tacit EoW status.

Non-recyclable refuse-derived combustibles (that are waste) have a specific category of facilities in France, distinct from that of waste incinerators, which is in fact a kind of escape of waste status by the valorisation operation.

Other gaseous, liquid or solid waste intended for use as combustible may have EoW status in France. The assessment of their environmental and health impact, depending on the composition of the waste, the combustion equipment (combustion performance, air pollution control) and the composition of the smoke must be done according to guidance (Collet and Partaix, 2021). The concentration limits in flue gases mainly come from (EU, 2015). This highlight that in real life there is a continuum between waste and products and that tacit EoW exists because it is an essential link of this continuum.

TABLE 1: The waste used as combustible have already in some cases tacit end-of-waste status: matter, regulatory regime for combustion or incineration and tacit end-of-waste status in France (NH = non-hazardous, H = hazardous).

Matter	Characteristics	Product or waste ?	NH or H?	Combustion or Incineration?	Possibility of EoW?
Biomass	Vegetable products of agriculture or forestry	Product	NH	Combustion	Already Products
	Vegetable waste of agriculture and forestry, of food processing industry, of paper production, of cork	Waste	NH	Combustion	Yes, Tacit
	Wood waste (without halogenated organic substances and heavy metals)	Waste	NH	Combustion	Yes, Tacit
Refuse-derived combustible ("solid recovered fuel")	Prepared mixture of non-recyclable plastics, paper, cardboard, wood and organic matter.	Waste	NH	Combustion with specific regime	No but specific Combustion regime
Gaseous, liquid or solid waste to be used as combustible	Organic waste, non-hazardous or hazardous (in particular treated wood waste for coating or with halogenated organic substances and heavy metals, wood waste from construction and demolition waste)	Waste	NH or H	Combustion if EoW Incineration	Yes, Explicit
Municipal waste	Including commercial waste, non-hazardous	Waste	NH	Incineration	No
Industrial waste	Hazardous	Waste	H	Incineration	No

The production of electricity or heat or liquid fuel (pyrolysis) or gas (gasification) from construction and demolition (C&D) waste wood and furniture waste wood will increase because there is not enough other primary wood for the EU flexible energy transition. Will these installations fall in the incineration regime (in case of waste status for wood) or in the combustion regime (with tacit or explicit EoW status for wood)? Investment and social acceptance are easier with product status.

6. THE TACIT EOW SHOULD BE GRANTED FOR ANY PREPARATION FOR REUSE AND RECYCLING OF MATERIALS IN CERTIFIED INDUSTRIAL LOOPS

6.1 EoW and the waste hierarchy

The product status by tacit EoW procedure is a logical consequence of recovery (Figure 3).

The material supplied by certified industrial recycling facilities should have EU-wide tacit end-of-waste status, because compliance is achieved. For the last level of the waste hierarchy, the term "sustainable landfill" should only be used for impermeable and non-self-reactive monostock for future recovery and EoW.

6.2 Waste streams that could immediately benefit of tacit end-of-waste status

The Joint Research Centre of the EU has ranked plastics, textiles, rubber (from end-of-life tyres), mineral fraction of construction and demolition wastes, paper and cardboard for priority to develop end-of-waste criteria at EU level (Orveillon et al., 2022). In total 12 wastes in 5 groups were top-ranked from about 70 candidates in 11 groups (Figure 4). Using the categorisation presented here (section 3), for these 12 wastes:

- 10 wastes will not be used in contact with the environment: 5 plastics, 3 textiles, paper and carboard, and mineral wool,
- 2 wastes will be used in contact with the environment: rubber (for outdoor uses) and aggregates (for construction).

For the 10 wastes not used in contact with the environment, the technical or commercial specifications mandatory for commerce are already available, and the registration of material with sameness in REACH is probably available. Tacit EoW could be immediate.

For the 2 wastes used in contact with the environment, an in-depth dossier to verify the impact on the environment is compulsory. For rubber, the dossier is available (EuRIC and ERTMA, 2021). For aggregates, many propositions with tests and limit values have been available for 15 years (JRC, 2009; Delgado et al., 2009; Saveyn et al., 2014; Tecnalia, 2021). The potentially moving elements from the waste to the environment are the leachable ones and the leachate concentration limits developed for inert waste landfill acceptance (see 3.4), eventually with some adaptations, are available and should be used since they are included in the EU landfill acceptance decision (EC, 2003).

7. CONCLUSIONS

The end-of-waste status is a consequence of the material recovery operations. The legal classification of discarded materials should be determined by their place in the waste management hierarchy. The wastes that are reused or recycled in certified industrial facilities should benefit of a product status by a tacit EoW procedure. This paper demonstrates that it already is the case for many wastes. The definition of waste should be narrowed down (Johannson, 2023) to exclude the matters that are resources.

A wide range of waste is already ranked by the Joint Research Centre of the EU for potential EoW (Orveillon et al., 2022), and particularly 10 ranked in the first five groups, not used in contact with the environment. The technical or commercial specifications mandatory for commerce of these 10 wastes are already available, and the registration of material with sameness in REACH is probably available.

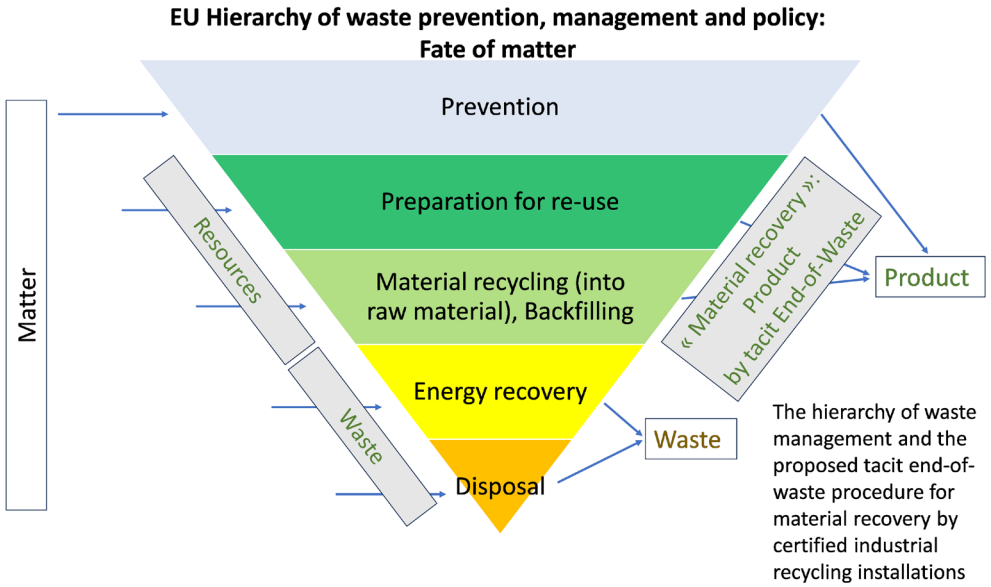

FIGURE 3: The relation between the waste hierarchy and the tacit end-of-waste procedure.

Figure A: List of priority streams grouped per category, and ranked based on their overall potential, according to the scoring system and data used for the present study

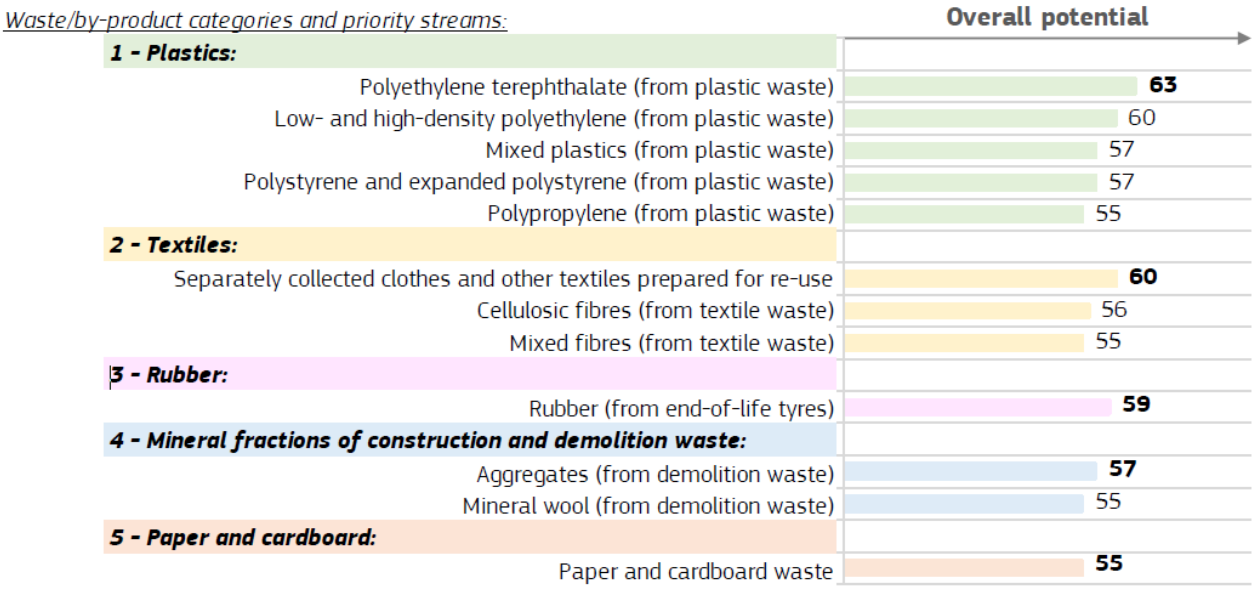

FIGURE 4: Priority streams of waste for EU end-of-waste criteria (Orveillon et al. 2022).

Tacit EoW could be immediate. This objective should be achieved in a harmonized way across the EU. For each material and each use, the four EoW conditions are met in EuRIC affiliated companies. An end-of-waste dossier should be made public, and the material should be registered in REACH if necessary. The tacit status of EoW at European level in accordance with Article 6(1) and 6(4) of the Waste Framework Directive should then be requested to Member States by the European Commission. Formally, this could be a request to the European Commission to ask all Member States that these materials produced in certified facilities and intended for a given use cease to be waste, in accordance with Article 6(1) of the WFD (EU 2018) which states: "*Member States shall take appropriate measures to ensure that waste which has been the subject of a recycling operation or another recovery operation is considered to have ceased to be used be waste if they meet the following conditions…*".

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