



Image courtesy of BladeBridge

# Towards Coherent Use of Waste Codes for Wind Turbine Blades across Europe

Across Europe, at least 16 different waste codes are being used for wind turbine blades at end-of-use. This is confusing, causes environmental risks and brings extra decommissioning costs. While a dedicated code for waste turbine blades would be preferred, this briefing finds that the use of UK/EWC code 17 02 04\* i.e. glass, plastic and wood containing or contaminated with dangerous substances is most common across Europe. The critical issue for transboundary waste transport lies in the lack of a dedicated Basel-code, resulting in costly transport for blades as unlisted waste.

# Turbine blades

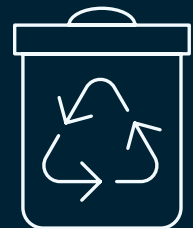


A growing volume of wind turbines is reaching end-of-use<sup>[1]</sup>. Turbine blades are considered particularly problematic. Made from light but durable glass and/or carbon fibre composites for high performance under extreme conditions<sup>[2]</sup>, what was a strength during the operational life of blades soon became a challenge in the waste stream<sup>[3,4]</sup>.

Spurred on by a self-imposed landfill ban<sup>[5]</sup>, the European wind industry's collaborative efforts have brought sustainable end-of-use solutions for wind turbine blades within reach<sup>[e.g.6]</sup>. Various innovations are on the market, from repair and longer lifetimes through reuse, to repurposing e.g. as outdoor furniture and bridges, and recycling<sup>[7,8]</sup>. As a breakthrough innovation, blade to blade recycling is now possible<sup>[9]</sup>.

But the scaling of blade end-of-use solutions is held back by a cocktail of regulatory, business model and investment challenges<sup>[10-11]</sup>. One of the most discussed is the use of a multitude of waste codes.

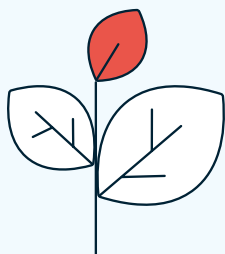
## Waste regulation processes



When turbine blades cannot be reused, they generally fall under waste legislation for transport and recycling. Multiple layers of regulations apply, namely primary legislation <sup>[e.g.12,13]</sup> and secondary regulations. These put obligations on producers of waste, covering the whole waste chain and requiring permits for the transporting, storing, treating, and recycling or disposing of waste, adhering to the waste hierarchy.

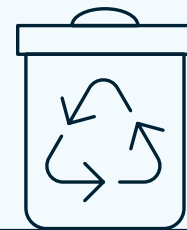
### Wastes are subject to the duty of care<sup>[14]</sup>, which is to:

- 1** Prevent harm caused by waste or allowing waste to escape control
- 2** Describe waste (its nature, quantity, properties, relevant waste code)
- 3** Pass the description to anyone that the waste is given to
- 4** Each person within the waste 'chain' must have the appropriate permit or registration to store, treat, recover, recycle or dispose of waste
- 5** Anyone carrying waste must be registered as a waste carrier



These obligations apply in the UK and when waste crosses international boundaries, when additional obligations apply. Due to the limited treatment facilities and relatively modest volumes of turbine blade waste, longer transports across borders are likely.

# Waste regulation processes continued



## Introducing waste codes

Waste codes are allocated based on how the waste was produced and the types of materials within products, and can be derived from the Lists of Wastes across Great Britain<sup>[15,16]</sup> while Northern Ireland followed EU Directives<sup>[17]</sup>, and for the European Union from the European Waste Catalogue<sup>[18,19]</sup>.

The lists are separate since Brexit but are still structured in the same manner, categorising absolute hazardous (AH), absolute non-hazardous (ANH) and mirror entries to the (non-)hazardous entries (MH, MN). A six-digit code is allocated following the process of first searching an appropriate code in chapter 01-12 or 17-20, followed by chapter 13-15 and, failing that, chapter 16 and, when still no suitable code could be allocated, choose the 99 code (wastes not otherwise specified)<sup>[16,19]</sup>.

## Why there is a problem with blades

A wide diversity of waste codes have been applied to wind turbine blades. This is caused by blades being made out of combinations of materials such as glass and/or carbon fibres and polymer resins, lack of sharing of information about material use in blade manufacturing, limited regulatory experience with waste blades, and the absence of a dedicated waste code for turbine blades.

Using diverse waste codes for the same type of waste creates uncertainty in the wind industry. Using the wrong waste code is an offence but, with so many different codes in use, it can be difficult to know which is the best one. Moreover, treatment facilities can only accept a waste for which they hold a permit. They would need to obtain a permit with a wide diversity of codes for turbine blades which could add to the challenges. Moreover, newer permits may list both wastes that are accepted and prohibited on a site. This can cause problems for operators and decommissioning contractors to find a suitable blade recycling facility.

## Current waste codes applied to blades

Across Europe, at least 16 different codes are being used, including 2 Basel codes, 2 UK codes, and 12 EWCs (**Table 1**).

For whole turbine blades at end-of-use, generally non-hazardous codes are in use. Most commonly, waste codes are derived from chapter 17 Construction and Demolition Waste. Code 17 02 04\* i.e. glass, plastic and wood containing or contaminated with dangerous substances is most commonly used in Europe (Northern Ireland, Ireland and Sweden with alleged consensus from Denmark, Luxemburg and Slovenia). Second most used is code 17 09 04 i.e. mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03 (Great Britain, Netherlands and Germany). Code 17 09 04 may be chosen when regulators are less certain about the material content but trust it is non hazardous, whereas 17 02 04 is a more precise code in terms of material content but with a potential for hazardous material. 16-Codes are less commonly used across Europe, and nobody reported the use of 99-codes.

As materials are recovered from turbine blades, different waste codes may be allocated to the secondary material fractions. Allocation of waste codes depends on the waste treatment process. Since the first step in blade processing is commonly a mechanical process<sup>[20]</sup>, 19 12 codes would be logical i.e. wastes from waste management facilities following mechanical treatment (as reported for Germany). Following thermal treatment, chapter 10 codes may be allocated for blades made mainly with glass fibre and processed as part of “wastes from manufacture of glass and glass products” (10 11) resulting “in waste glass-based fibrous materials” (10 11 03).

Some codes have been used to suggest that the waste is primarily a plastics fraction, which may be less likely given that thermoset plastics would either still be in the mix with glass/carbon fibres (e.g. with mechanical recycling) or have been burned (e.g. in thermal processes). Alternatively, it is possible that such waste code refers to another fraction of the blade, for example if it were made with a plastic rather than a balsa wood core.

# Waste regulation processes continued



**Table 1: Currently used waste codes** [22-28]

Country	Waste codes	Explanation
England, Wales, Scotland	EWC/UK 170904, UK 160214	<p><b>Chapter 17: Construction and demolition waste:</b></p> <ul style="list-style-type: none"> <li>• EWC 170204* glass, plastic and wood containing or contaminated with dangerous substances (MH)</li> <li>• EWC/UK 170904 mixed construction and demolition wastes other than 170901, 170902, 170903 (MNH)</li> <li>• EWC 170203 plastic (MNH)</li> <li>• EWC 170604 insulation materials other than 170601, 170603 (MNH)</li> </ul> <p><b>Codes from other chapters:</b></p> <ul style="list-style-type: none"> <li>• EWC 070213 waste plastic (ANH) from organic chemical process</li> <li>• EWC 101103 waste glass-based fibrous materials (ANH), from manufacture of glass and glass products - thermal process</li> <li>• EWC 101112 waste glass other than 101111 (MNH)</li> <li>• EWC 101199 waste not otherwise specified (ANH)</li> <li>• EWC 120105 plastics shavings and turnings, from shaping and physical and mechanical surface treatment of metals and plastics (ANH)</li> <li>• EWC 191204 plastic and rubber (ANH), from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified</li> <li>• EWC 191212 other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 191211 (MNH)</li> <li>• UK 160214 discarded equipment other than those mentioned in 160209 to 160213 (AN), from electrical and electronic equipment</li> <li>• EWC 160119 plastics (ANH), from vehicles</li> </ul> <p>Basel GE020 glass fibre waste</p> <p>Basel EU3011 (formerly B3011) mixtures classified under separate (sub)indents of either non halogenated polymers, cured resins / condensation products or fluorinated polymers.</p>
Northern Ireland	EWC 170204	
Ireland	EWCs 170204, 170203	
Netherlands	Basel GE020, EWC 170904	
Norway	Basel EU3011, EWC 070213	
Denmark	Basel EU3011, EWC 070213	
Sweden	EWC 170204	
Spain	EWCs 160119, 101103, 170604	
Germany	EWCs 170203, 170904, 101103, 191204, 191212, & EU list	
EU	EWCs 170203, 070213, 101103, 101112, 101199, 120105	

## Basel convention

Finally, transfrontier transport is governed by Basel codes under EU regulation<sup>[21]</sup>, rather than UK/EWC codes. According to the Netherlands, based on materials commonly used in blades (glass fibre, epoxy, polyester, vinylester, polyurethane, thermoplastics, PVC, PET, coatings PUR, metal wires) the shipment should be classed as unlisted waste requiring prior notification. This conclusion is echoed across Europe (Norway, Sweden, Denmark, Luxemburg, Slovenia).

Without a dedicated Basel-code, blade waste is considered “unlisted” and must be handled similarly to hazardous waste. This adds cost and risk to blade end-of-use processes. This issue is further compounded for the wind industry as transfrontier shipment is likely needed in many cases, because most recycling facilities depend on high volume processing<sup>[8]</sup> which means that (due to relatively low volumes of blade waste) only few facilities may be able to operate across Europe.

# Recommendations for future regulative practices



## Government: Dedicated waste code

The wind industry has repeatedly called for a dedicated UK/EWC waste code for wind turbine blades. For example, a dedicated code could be added under UK/EWC 1602 “wastes from electrical and electronic equipment” to class waste blades in the same place as other turbine components. But adopting new waste codes requires legislative change in the EU and UK, which could take a long time.

There are further challenges with this solution. It would have to be successfully argued that a specific disposal route for (fractions of) turbine blades is necessary, requiring specific facilities or disposal companies<sup>[29]</sup>. This argument hinges on the ability to monitor such waste stream more transparently, with waste management supported by a label on blades to specify material content.

In the first instance, an interim solution could involve consistent use of waste codes across Europe, based on consensus between regulators.

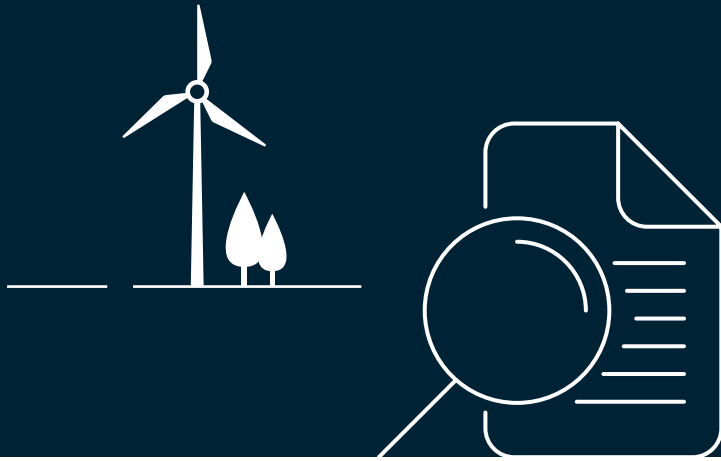
A dedicated UK/EWC code would not resolve the transboundary transport issues. This would require a dedicated Basel-code, which has been reported as an even more challenging process.

## Industry: Data sharing

Waste codes that class turbine blades as hazardous are commonly used. In principle, it should be evidenced that the waste stream does not contain hazardous substances. However, the most certain way to make this evident would be with a greater insight into the materials that have been used in the manufacturing and repair of the turbine blade (without having to share the design details). Blade passports could give environmental regulators the confidence to allocate non-hazardous codes and ease transport.



# References



1. Bennet et al. 2021. Sustainable Decommissioning: Wind Turbine Blade Recycling.
2. Mishnaevsky et al. 2017. Materials for Wind Turbine Blades: An Overview.
3. Jensen et al 2020 Highlighting the need to embed circular economy in low carbon infrastructure decommissioning: The case of offshore wind.
4. Beauson et al. 2022. The complex end-of-life of wind turbine blades: A review of the European context.
5. WindEurope. 2021. Wind industry calls for Europe-wide ban on landfilling turbine blades.
6. Task 45 | IEA Wind TCP
7. Leahy et al. 2023. IEA Wind Task 45 - Deliverable 2.2 - Blade End-of-Life Treatments: State of the Art, Challenges, Barriers & Environmental Impacts.
8. Kramer et al. 2024. Quantifying circular economy pathways of decommissioned onshore wind turbines: The case of Denmark and Germany.
9. Beauson et al 2025 Glass Fibers Produced With Recovered Glass Fibers From Wind Turbine Blades—Recycling Value Chain and Properties of Glass Fibers and Composites.
10. Velenturf. 2026. More Power from Less Materials: Towards a Circular Economy in the Wind Industry for the UK.
11. Green Alliance. 2026. How to build a competitive, circular UK wind industry.
12. Waste Framework Directive - Environment - European Commission
13. The Waste (England and Wales) Regulations 2011
14. Waste duty of care: code of practice (accessible version) - GOV.UK
15. The List of Wastes (England) Regulations 2005
16. EA, SEPA, NRW. 2021. Guidance on the classification and assessment of waste (1st Edition v1.2.GB). Technical Guidance WM3.
17. The List of Wastes Regulations (Northern Ireland) 2005
18. List of waste referred to in article 7 of Directive 2008/98/EC (2000/532/EC).
19. Commission notice on technical guidance on the classification of waste (2018/C 124/01).
20. Lund and Madsen. 2024. State-of-the-art value chain roadmap for sustainable end-of-life wind turbine blades.
21. Basel Convention - Home Page
22. Mathias Kipker, DSV A/S, Feb 2026
23. Based on RESCUE desk research and stakeholder consultation
24. Mackie et al 2022 Wind turbine blades at end-of-life: A preliminary summary of policies, legislation, guidelines, and initiatives that address reuse, recycling, repurposing, and disposal. IEA Wind Task 45 – Work Package 4.1
25. Ricard 2023 Kortlaegning af maengder og behandlingsmuligheder for vindmollevinger – initiativ 115. Milljoprojekt nr 2241.
26. Dragan, M. 2019. Accelerating wind turbine circularity. Wind Europe.
27. Efecto Reempleo 2019 Decommissioning wind turbines: circular economy applied to repowering. Wind Europe, Wind turbine circularity workshop
28. SeeOff 2022 Handbook for Offshore Wind Decommissioning
29. Kuhne et al 2022 Final report: Development of deconstruction and recycling standards for rotor blades. Federal Environment Agency. 92/2022.
30. TFS National Office. 2021. ntfso-basel-plastic-notice-v3.pdf

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