



Absorbing the Potential of Wood Waste in EU Regions and Industrial Bio-based Ecosystems — BioReg

Tables in D1.2: STATE OF THE ART TECHNICAL REPORT



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Table 1: Classification of wood waste according to the European Waste Catalogue

3	Wastes from wood processing and the production of panels and furniture, pulp, paper, and cardboard		
03 01	Wastes from wood processing and the production of panels and furniture		
03 01	01	Waste bark and cork	
03 01	04*	Sawdust, shavings, cuttings, wood, particle board and veneer containing hazardous substances	
03 01	05	Sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04 03 01 99 Wastes not otherwise specified	
03 03	Wastes from pulp, paper and cardboard production and processing		
03 03 01	Waste bark and wood		
03 03 02	Green liquor sludge (from recovery of cooking liquor)		
03 03 05	De-inking sludges from paper recycling		
03 03 07	Mechanically separated rejects from pulping of waste paper and cardboard		
03 03 08	Wastes from sorting of paper and cardboard destined for recycling		
03 03 09	Lime mud waste		
03 03 10	Fibre Rejects, fiber-, filler- and coating-sludges from mechanical separation		
03 03 11	Sludges from on-site effluent treatment other than those mentioned in		
03 03 99	Wastes not otherwise specified		
15	Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified		
15 01	Packaging (including separately collected municipal packaging waste)		
	15 01 03	Wooden packaging	
17	Construction and demolition wastes (including excavated soil from contaminated sites)		
17 02	Wood, glass and plastic		
	17 02 01	Wood	
17 04*	Glass, plastic and wood containing or contaminated with hazardous substances		
Wastes from waste management facilities, off-site wastewater treatment plants and the preparation of water intended for human consumption and water for industrial use			
19	19 12	Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified	
	19 12 06*	Wood containing hazardous substances	
	19 12 07	Wood other than that mentioned in 19 12 06	
Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions			
20	20 01	Separately collected fractions (except 15 01)	
	20 01 37*	Wood containing hazardous substances	
	20 01 38	Wood other than that mentioned in 20 01 37	



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Table 2: UK wood waste classification and grades

Grade	Typical Sources of Raw Material	Typical Materials	Typical Non-Wood Content Prior to Processing
Grade A – “Clean” Recycled Wood	Distribution. Retailing. Packaging. Secondary Manufacture e.g. joinery. Pallet Reclamation	Solid softwood and hardwood. Packaging waste, scrap pallets, packing cases, and cable drums. Process off-cuts from manufacture of untreated products.	Nails and metal fixings. Minor amounts of paint, and surface coatings.
Grade B – Industrial Feedstock Grade	As Grade A, plus construction and demolition operations and Transfer Stations.	May contain up to 60% Grade A material as above, plus building and demolition materials and domestic furniture made from solid wood.	Nails and metal fixings. Some paints, plastics, glass, grit, coatings, binders and glues. Limits on treated or coated materials as defined by Waste Incineration Directive
Grade C – Fuel Grade	All above plus Municipal Collections, Recycling Centres Transfer Stations And Civic Amenity Recycling sites	All of the above plus fencing products, flat pack furniture made from board products and DIY materials High content of panel products such as chipboard, MDF, plywood, OSB and fibreboard.	Nails and metal fixings. Paints coatings and glues, paper, plastics and rubber, glass, grit. Coated and treated timber (non CCA or creosote).
Grade D – Hazardous Waste	All of the above plus fencing, trackwork and transmission pole contractors.	Fencing Transmission Poles Railway sleepers Cooling towers	Copper / Chrome / Arsenic preservation Treatments Creosote



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Table 3: Wood classification criteria in some European countries (CEDEN, 2016)

		Natural wood (untreated or insignificant)	Slightly adjuvanted wood (glues, varnishes, paints, coatings ...)	Impregnated wood (CCA, CCB or creosote), soiled wood
European Classification of Wastes (Commission No 94/3 / EEC of 20 December 1993. In France: Decree No 2002-540 of 18 April 2002 Annex II to Article R. 541-8 of the EC)	Status	Non-hazardous waste		Hazardous waste
	Waste code	15 01 03 (wood packaging), 03 01 05 by-products of sawmills	03 01 05 (particle board, etc.), 17 02 01 (construction, demolition), 19 12 07, 20 01 38	03 01 04*, 15 01 10*, 17 02 04*, 19 12 06*, 20 01 37* (wood waste containing hazardous substances)
French classification. Non-regulatory, widely accepted by professionals but unsatisfactory: approach in progress at national level to adapt this classification.		A	B	C
		Clean wood not adjuvanted or very weakly adjuvanted, e.g.: pallets with agglomerated dice	Wood "weakly" adjuvanted, ie under the thresholds of pollutants fixed by article 541.8 of the Environmental Code.	"Strongly" adjuvanted wood (impregnation with metallic salts, creosoted wood), i.e. above the thresholds of pollutants fixed by article 541.8 of the Environmental Code.
		2910 A If end of the waste" approach	2910 B If compliance with the thresholds of the decree of September 2013 for clean wood waste or very weakly adjuvanted wood or if EOW approach for adjuvanted wood waste. 2971 (CSR)	2770 (incineration of hazardous waste), 2771 (incineration of non-hazardous waste)
Netherlands		A	B	
		Unpainted and untreated wood	Not falling under category, A-or C, including painted, varnished and glued wood	
German Classification. The classification leans on the European waste catalogue (2002)		All	All	AIII
		Clean wood	Without organochlorine	With organochlorine
			Deep treatment	
United Kingdom (source WRA)		A	B	C
		Clean wood	60% A + construction wood + furniture	A + B + municipal waste, recycling platforms
COST E31		1	2a	2b
		Clean wood	No deep treatment	No deep treatment
Finland (classification)		A	B	C
				D



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EUROBIONET III: leans on standard ISO 17 725		Clean wood	Construction wood excluded and excluding preservation treatment	Excluding preservation treatment		Preservation treatment
DEMOWOOD proposal		DW O	DW I	DW II	DW III	DW IV
		Pulp mill, panel board, energy (2910 A(Fr), A (Finl.), EN ISO 17225-1	Panel board, energy (2910 B(Fr), Class B (Finl.), EN ISO 17225-1,17225-1.2.2, 17225-1.3.2 (used wood)	Panel board, energy (CSR - EN 15359 (Fr), class C (Finl.), EN 15359 if in compliance with threshold clean wood (ISO 17225-1)	Energy only. Incineration of non-hazardous waste (Fr.), Class C, EN 15359 "incineration"	Hazardous waste
Corresponding normative framework	Energy	TC 335 biofuels: Virgin wood and wood waste, excluding wood waste which may contain halogenated organic compounds or heavy metals due to treatment with wood preservatives or coatings and in particular wood from construction and demolition.		TC 343 RDF: Includes non-hazardous wood waste. Hazardous waste excluded.		Not applicable
		EN ISO 117225-1 EN ISO 117225-1.2.2 EN ISO 117225-1.3.2				
		Standard EN 15 359 et EN 15 357 (définitions, catégories)				
	Panel board	EPF standard for delivery conditions of recycled wood				

Table 4: Absolute wood waste generated (total, hazardous and non-hazardous) in 2010 (Eurostat)

2010	Total	Hazardous waste	Non-hazardous waste
EU-28 total and top 5 wood waste producers	In million of tonnes		
European Union (28 countries)	60.95	1.78	59.18
Finland	12.28	0.04	12.24
Germany	10.81	1.08	9.73
France	8.95	0.08	8.87
Italy	3.76	0.01	3.75
Poland	3.51	0.00	3.50



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Table 5: Volume of wood waste treated (total, hazardous and non-hazardous) in 2010, 2004-2010 change (%)

In millions of tonnes	Total	2004-2010 % change	Hazardous	Non-hazardous
EU-28	55.05	109%	1.46	53.59
Finland	10.46	201%	0.02	10.45
France	8.87	108%	0.00	8.87
Germany	9.92	347%	1.15	8.77
Italy	4.25	-0.03%	0.01	4.24
Poland	5.04	442%	0.00	5.04

Source: Eurostat waste statistics (2010)

The Table 5 shows the total volume of treated wood waste in 2010. According to Eurostat waste statistics (2010), the supply of wood waste to be used in the wood-based industries comes predominantly from the manufacture of wood, cork, straw and painting materials (21.7 million m³, including sawmilling, wood-based panels, logs and pallets), construction products (8.8 Mt), paper and packaging materials (6.8 Mt including pulp), material recovery (6.7 Mt) and services (4.7 Mt), excluding wholesale of waste and scrap. Besides that, there are other important 'waste generating industries', often regionally specific, such as ski manufacturing in Austria or clog manufacturing in the Netherlands.

Table 6: Production and Collecting of wood waste

OBJECT/ AIM	MEAN	TARGET	POSITIVE IMPACTS
REUSE: furniture, beams, timbers	Repair centres, recycling centres	households and enterprises	Carbon storage, money savings, virgin biomass preservation
Encourage sorting on site (by optimising the place)	Compartmentalized skips	Enterprises	Increase valorisation rate
Forcing producers to recycle	Extended producer responsibility/ take back obligations	Producers of furniture such as: Eco-mobilier and Valdivia	Increase valorisation rate
Encourage producers to sort	Sorting platform and collecting centre for waste from construction and demolition	Enterprises of construction and demolition (production/collecting/sorting) and waste companies (collecting/sorting)	Increase valorisation rate



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Table 7: Results of 2 grindings-screenings with different grills' cells size on the shredders (100 & 150 mm) - (BiosEnergieSystem, 2004)

	100mm screen basket		150mm screen basket	
fuel	6,400 kg	76.0%	12,200 kg	83.2%
undersized fuel (<10mm)	1,700 kg	20.2%	2,100 kg	14.3%
iron metals	290 kg	3.4%	340 kg	2.3%
non-ferrous metals	30 kg	0.4%	20 kg	0.1%
Total	8,420 kg	100.0%	14,660 kg	100.0%

Table 8: Impacts of best practices in value chain: Sorting and processing of wood waste

OBJECT/AIM		MEANING		TARGET		POSITIVE IMPACT
Improve product in view of meeting outlet requirements	Extraction of undesirables	Manual/ visual sorting	Manual, shovel equipped with pliers	wood waste undesirables	Framework windows, doors	Reduction Zn, Pb in sorted products
					outdoor wood waste	Reduction of heavy metals
					Sleepers, fences	Reduction of benzo (a)pyrene
	Separation of material	Mechanical sorting	Shredding, screening, over band, eddy current. Innovative solution for windows: mechanical treatment for (chipping, milling) for coating and chemical treatment for preservatives	Other undesirables	Plastics, glass, padded, ferrous, non-ferrous.	Visual improvement makes possible to achieve requirements of outlets and to separate wood from other materials
	Separation of material	Optical sorting	NIR	wood waste undesirables	MDF	possible to separate fibre panel to meet requirements of panel board industry



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			XRF		Polluted wood	possible to separate polluted wood to meet requirement of outlet.
	Particle size reduction	Shredding	Low rapid shredder fitted with sieves, Specific low shredder	Rough wood waste		Lead to appropriate particle size. Consequence: avoid resorting to screening step- money saving
	Fine particle extraction	Screening	Trommel, stars screen	Shredded wood waste		Improve screened product, possible to meet requirements of outlet, % of particle smaller than 3.15 mm
	Blending	Blends of different grades of wood waste	Loaders	Rough wood waste and prepared wood waste		Production of a mixed product: possible to meet certain conditions: moisture, solid wood rate, MDF rate, clean wood rate, fine particle rate
Improve environmental impact and human health impact	Protect operators from dust	Stationary and electric equipment	Shovel, loader, shredders, screens	All along the step of sorting/ treatment		Reduction of consumption of fossil fuel / noise. Money savings. Reduction of dust emission. Improvement of human health
		Shredding, screening, loading	Confined equipment's, aspiration pipe system, water aspersion			
		Extraction	Endless screw			
		Individual protection equipment	Helmet category 3, glasses			



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Table 9: Limit values in wood waste in the panel industry (EPF recycled wood standard)

Elements / Compounds	Limit values (mg/kg recycled wood)
Arsenic (As)	25
Cadmium (Cd)	50
Chromium (Cr)	25
Copper (Cu)	40
Lead (Pb)	90
Mercury (Hg)	25
Fluorine (F)	100
Chlorine (Cl)	1000
Pentachlorophenol (PCP)	5
Creosote (Benzo(a)pyrene)	0,5

Germany and France are the leading producers of particleboard in Western Europe (see Table 11). EU particleboard production was to about 31 million m³ in 2011 (Indufor,2011).

Table 10: Wood waste consumption in particleboard production (WBPI)

Country	Particleboard production 2013, '000m³	Share of wood waste in raw material mix	National consumption of wood waste in panels, '000 tonnes
Germany	5,600	30%	1,400
France	3,811	22%	680
Italy	2,652	95%	2,150
United Kingdom	2,012	52%	890
Austria	1,840	35%	550
Spain	1,465	32%	390
Belgium	1,250	70%	850
Sweden	600	0%	-
Portugal	590	25%	130
Switzerland	370	0%	-
Denmark	316	67%	180

Tonnes as received with typical moisture content 20-25%

France and Germany have experienced increasing prices for all wood feedstocks, driven by increasing competition from bioenergy during the last decade. However, there is still no significant shift towards the use of wood waste in particleboard production due to concerns over panel quality. France has become the key supplier of wood waste for panel production in neighbouring Belgium and Italy, while domestically the share of wood waste used in the raw material mix remains still low. However, French panel industry has committed in 2017 to use 500 000 tons of wood waste in addition compared to the current situation.

Northern Italy is leading in Italian particleboard industry, and many producers are well positioned to be sourced from France. Some of the largest one of these have established railway infrastructure to transport wood waste over long distances and have regular deliveries from the neighbouring countries. The fibreboard, unwanted by the panel industry due to their lack of structure, could be used in the manufacturing process of the particle board.



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Table 11: Wood fuels for primary energy production in the EU by sub-category

Wood fuels used for primary energy production in the European Union by sub-category (2011). Data source: Eurostat.

Wood (fuelwood from forests)	49%
Wood waste (solid by-products from forest industries)	17%
Black liquor	15%
Other wood and wood waste (e.g. recycled wood)	20%
Wood fuels, total	100%

Table 12: Conclusion of the best practices for the valorisation step in the value chain.

OBJECTIVE/ AIM		MEANING	TARGET	POSITIVE IMPACT
Improve supplied pre-treated wood wastes on the valorisation site (post-treatment)	Post-treatment (the wood waste supply does not always meet with final requirement of outlet)	Shredding, screening, ferrous and nonferrous removal, NIR, XRF...Blending. These treatment steps are like those encountered on sorting/treatment dedicated platforms.	Rough wood waste or pre-treated wood waste	Ensures the final achievement of requirements of the outlet. Especially requirements of combustion/incineration and production of used wood-based panels.
Energy recovery	Get a good energy efficiency	CHP: heating valorisation (industrial supply, district heating network...) Resort to condensation.	Operators (energy companies), technologies providers	Economies savings, positive environmental impact (fossil fuels substitution).
	Ensure gas treatment	Beyond classical equipment (boiler volume, staged combustion, SNCR, SCR, coal, lime, bag filters, electro-filters, resort to condensation.	Municipal authorities (tenders), energy companies (operators), consultancy	Respect of emissions thresholds, positive environmental impact.
	Ensure disposal of ashes: in agriculture or in forest, cemetery, concrete, ceramics, road	Improve quality of ashes: shredding, screening, ferrous and nonferrous removal (eddy current, over band), chemical extraction of heavy metals...	Operators (energy companies)	Positive environmental impact (preservation of virgin resources, substitution of chemical nutrients)



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	infrastructures.			and money savings (no resort to landfilling)
Recycling	Maintain quality of wood waste-based particle board panel (recycling "to infinity" could lead to pollution of recycled panel board).	Monitoring and control of wood waste supply on site (optical sorting XRF, NIR). Dilution with clean wood or virgin wood just in case, or valorisation in energy for process.	Operator (panel industry), technologies providers	Positive environmental impact (formaldehyde emissions...), respect of thresholds (panel board), sustainability/relevance of cascade use.

Column 1		Column 2				Column 3
No.	Recovery method	Permissible waste wood categories				Special requirements
		A I	A II	A III	A IV	
1	Processing of waste wood to wood chips for the manufacture of derived timber products	Yes	Yes	(Yes)		The processing of waste wood from category A III is only permissible if varnishes and coatings have been largely removed by pretreatment or will be largely removed during processing.
2	Production of synthetic gas for further chemical use	Yes	Yes	Yes	Yes	Recycling is only permitted in installations licensed for this purpose under Article 4 of the Federal Immission Control Act.
3	Manufacture of active carbon/industrial charcoal	Yes	Yes	Yes	Yes	Recycling is only permitted in installations licensed for this purpose under Article 4 of the Federal Immission Control Act.

Table 13: German classification (wood waste ordinance, 2002)

Table 14: Panel industry in Baden-Württemberg and nearby (CEDEN according to EPF)

Company	Location	Region	Type of panel
ELKA	Morbach	Close to BW	Particle board
WERSALIT	Oberstenfeld	In BW	Particle board
NOLTE	Holzwerkstoff	In BW	Particle board
PFLEIDERER	Leutkirch	In BW	Particle board
HOMANIT	Losheim	Close to BW	MDF
SONAE INDUSTRIA	Eiweiler	Close to BW	MDF



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Table 16: Wood waste sources and their end use in Styria

Source	Total t/a	Reuse/ recycling t/a	Composting t/a	Thermal utilization t/a
<u>Municipal</u>	<u>32.500</u>	<u>22.400</u>	<u>200</u>	<u>9.800</u>
<u>Trade and Industry</u>	<u>52.800</u>	<u>36.400</u>	<u>400</u>	<u>16.000</u>
<u>Saw dust, shavings, untreated</u>	<u>67.800</u>	<u>67.800</u>	<u>0</u>	<u>0</u>
Cuttings, untreated	4.200	4.20 0	0	0
<u>Total</u>	<u>157.300</u>	<u>130.800</u>	<u>600</u>	<u>25.900</u>
	100,00%	83,15%	0,38%	16,47%



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Table 17: Municipal Waste in Poland 2005-2015 (Source: Main Statistic Office in Poland 2016)

WOJEWÓDZTWA VOIVODSHIPS	2005		2010		2014		2015	
	w tys. ton in thous. tonnes	na 1 mieszkańca w kg per capita in kg	w tys. ton in thous. tonnes	na 1 mieszkańca w kg per capita in kg	w tys. ton in thous. tonnes	na 1 mieszkańca w kg per capita in kg	w tys. ton in thous. tonnes	na 1 mieszkańca w kg per capita in kg
P O L S K A	9352	245	10044	263	10330	268	10864	283
P O L A N D								
Dolnośląskie	893	309	994	346	943	324	987	340
Kujawsko-pomorskie	448	217	515	249	546	261	593	284
Lubelskie	338	155	338	157	382	177	385	180
Lubuskie	280	277	297	294	328	321	334	328
Łódzkie	639	248	669	264	642	256	658	263
Małopolskie	630	193	766	232	764	227	796	236
Mazowieckie	1500	291	1573	301	1399	263	1660	311
Opolskie	255	243	260	253	268	268	278	279
Podkarpackie	346	165	360	171	381	179	418	196
Podlaskie	268	223	243	204	275	230	286	241
Pomorskie	587	267	683	306	695	302	703	305
Śląskie	1307	278	1380	298	1552	338	1520	332
Świętokrzyskie	185	144	200	157	199	157	209	166
Warmińsko-mazurskie	313	219	328	230	363	251	390	271
Wielkopolskie	862	256	915	268	1045	301	1070	308
Zachodniopomorskie	502	297	523	309	549	320	577	337

a Dane szacunkowe. Od 2014 r. pozycja obejmuje odpady odebrane od wszystkich właścicieli nieruchomości i uznawana jest za odpady wytworzone ze względu na objęcie od 1.07.2013 r. przez gminy systemem gospodarowania odpadami komunalnymi wszystkich właścicieli nieruchomości.

a Estimated data. From 2014 includes waste collected from all inhabitants and is considered to be waste generated because of covering by municipalities from 1.07.2013 all real-estate owners with municipal waste management system.

Total	105 378,3253
030101	39,5000
030104*	8,6000
030105	90 894,0300
030301	11,4800
150103	3 283,7119
150105	816,0115
150106	869,4066
170201	7 051,4336
170204*	489,8967
191206*	0,0450
191207	1 849,3800
200307	64,8300

Table 18: Wood waste generated in 2015 in Lubelskie (source: Marshal Office in Lublin)

Table 19: Wood waste generated in 2014 in Portugal per sectorial activities (INE, 2016) (in red the hazardous wood wastes)

Sectorial activities	wood waste (t)		Percentage to total wood waste produced in Portugal
Wood transformation: sawmill, panel industry, carpentries, joineries...	03 01 01	47 925	17.5
	03 01 04	248	0.1
	03 01 05	30 347	11.1



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		78 520	28.8
Building, demolition	17 02 01	10 902	4.0
	17 02 04	12	0.004
		10 914	4.0
Waste management plant	19 12 06	21	0.008
	19 12 07	67190	24.6
		67211	24.6

Table 20: Modes of wood waste recovery in some European countries.

Country	Mode of valorisation
Belgium	<p>Belgium imports large quantities of wood waste (more than 1 million tons) to power its panel industry (UNILIN) and its cogeneration plants. Green certificates and a high rate of use of wood waste in panel industry allowed Belgium to reach a high level of wood waste valorisation.</p> <p>The waste policy is performed on the basis of different implementation plans. Biomass is discussed in several of them, including the Implementation Plan on Wood, that covers:</p> <ul style="list-style-type: none"> - Secondary processing of wood waste (plate production, wood processing); - wood waste from the final processing: wood waste that is released during the production of furniture, packaging, timber, joinery; - wood waste from businesses: construction and demolition wood, packaging, furniture; - wood waste from households: construction and demolition wood, furniture, garden wood such as wood fences or wood garden houses; - Wooden railway sleepers. <p>It is recognized that biomass, as part of the renewable energy targets, offers a large potential for energy production. It is also recognized that this places recycling of certain waste streams under strong pressure, for this reason burning biomass is subject to restrictions.</p> <p>The destination of clean wood waste in Belgium is in principle raw material for industry, unless it is not considered of use. Contaminated wood waste can be used for the energy market. There is an internal negotiation about the sourcing of material to avoid competition in resources.</p>
Finland	<p>The forest resources in Finland have been steadily increasing and this development is predicted to continue. The forest resources are used mostly in chemical and mechanical forest industries. The by-products from the mechanical forest industry are used in the chemical industry, and there are optimised inner cycles in the chemical industry (e.g. use of black liquor). The residual streams are used mostly for energy production, which supports the total efficiency of the industry. Most of the products from chemical industry are exported as pulp, paper and board. The mechanical industry exports mostly timber and plywood.</p> <p>While Direct use of wood for energy is lower than in the EU, and the use of wood for pulp industry much higher, energy use of wood industry by-products is very significant, due to an optimised integrated wood use especially in pulp and paper industry.</p> <p>Energy recovery only: boilers for classes A and B. Classes C and D for incineration. Finland aims to respect the cascading use of wood waste.</p>



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Switzerland	Switzerland mainly recycles wood waste into energy (district heat networks) and does not recycle material. A large part of wood waste is exported to Italy (panel) or Germany (energy). According to a study carried out in 2014 in the country, the current management is considered to be coherent with regard in particular to environmental criteria, despite the low material valuation.
Ireland	<p>220,000 tons of non-hazardous wood waste recovered in 2010, from sorting facilities, construction and public works. Ireland does not import and export wood waste.</p> <p>The main sources were outputs from mechanical waste treatment facilities, packaging waste, construction and demolition (C&D) waste and municipal waste. Relatively minor amounts of segregated wood waste were reported as exported or imported for recovery or disposal. Wood waste may also be disposed of in mixed C&D and municipal waste streams. It should be noted that virgin residual wood from forestry, sawmills and similar, which is classed as a by-product rather than a waste, is not included in this figure.</p> <p>The three primary uses of wood waste noted from the National Waste Report 2010 dataset were general</p>

Country	Mode of valorisation
	<p>recovery applications, recovery in composting processes and the use as a fuel.</p> <p>The following types of wood are considered as waste (and are subject to regulatory control unless the holder demonstrates, to the satisfaction of the relevant competent authority, that the material meets applicable byproduct or end-of-waste status criteria):</p> <ul style="list-style-type: none"> - discarded treated and untreated wood products. In this context, treatment means the application of chemicals (paints, laminates, varnishes, and preservatives) to enhance the performance of the product or other artificial impregnation or coating; - off cuts, shavings, chip, and dust arising from the processing of treated wood; - any virgin wood mixed with the above; and - any wood separated, segregated, or otherwise obtained from mixtures of the above. <p>In general wood waste is subject to regulatory control unless the material meets by-product or end-of-waste criteria. It must be managed in accordance with waste law and waste management facilities must hold the necessary authorisations.</p> <p>Material recovery: 62%, energy recovery: 32%.</p>
Netherlands	<p>The Netherlands consume half of their wood waste production (the rest is exported), mainly for energy production.</p> <p>In 2010, in The Netherlands, 450,000t of wood waste was used for energy generation, while less than 200,000 tons were recycled for chipboard and other materials production. The National Waste Plan gives a minimum standard for processing for all three categories. The minimum standard for A (and B) wood is recovery. Minimum recovery for A and B wood includes various options:</p> <ul style="list-style-type: none"> - Recovery of material; - Recovery of products; - Main use of waste as a fuel or other means to generate energy. <p>The Netherlands gives no preference between the options. The criteria work on a case-by-case status. Postconsumer (clean) wood waste from within the Netherlands is waste until the moment of further processing. It should be destined for useful recovery, which includes both material recovery and energy use as main use.</p>



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Germany	<p>In Germany, a trader country, there is a trade deficit of wood fibre. In 2010, the flow of wood fibres to Germany was 67 million m3 while the exports were 60.4 million m3. This trade deficit is mainly generated by recovered wood and paper, wood-processing and pulp industries. In other sectors, i.e. sawmill and woodbased panel and paper industry, exports are higher than imports. Moreover, Germany is the largest paper producer (and also consumer) in Europe and therefore also the largest importer of pulp in Europe. Also, it is Europe's largest consumer and producer of particleboard.</p> <p>In Germany, it is not allowed to dispose untreated municipal solid waste (including wood) in landfills. Thus, practically no industrial wood waste is disposed in landfills. Germany has set up in 2002 a wood waste ordinance which has allowed and accompany the valorisation of wood waste. For 10 years, the market is mature in Germany, with end-users (panel industry and energy) which absorb the whole resource of wood waste.</p> <ul style="list-style-type: none"> - Recycling material = 20% (class A1-A2) = around 2 Mt. Panel industry after transit in sorting facilities: BTP, industry, packaging - Energy recover = 80% (classes A1 - A 4) = around 6 Mt. 76 plants (last commissioned in 2008).
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Country	Mode of valorisation
	<p>Cogeneration plants: building and municipal waste. Mature market.</p> <p>Landfilling of banned organic products.</p>
France	<p>In France, an important part of wood waste is disposed of in landfill and more than 1 million tons could be valorised if landfilling was banned (according to national wood waste plan). An important part of wood waste streams are exported in Belgium and Italy given the fact the French current demand (mainly panel factories) does not allow to valorise the whole resource. In France, only 3 or 4 plants valorise important flows of wood waste (UPM Kymmene, Plaine du Rousillon, Norske Golbey), compared to 76 in Germany!</p> <p>Valorisation: 79%, of which 57 in material recycling (Panel industry: 1.8 Mt / year, of which 1 Mt exports (Belgium, Italy ...) and 22% in energy.</p>
UK	<p>The waste management hierarchy from the EU Waste Framework Directive was transposed into UK law, through the Waste (England and Wales) Regulations in 2011. The hierarchy of waste management follows this order: prevention, preparing for re-use, recycling, other recovery (e.g. energy recovery through incineration and pellet production), and disposal. Except for lower grade wood waste, energy recovery is considered in this case a better environmental option than recycling.</p> <p>Increase in the share of wood waste separated (+0.8 Mt between 2009 and 2012).</p> <p>"Call of evidence" in 2013 to consider the ban on wood waste in landfills.</p> <p>According to the WRAP, less than 1 Mt buried in landfill out of a total of about 4.5 Mt. At least 2/3 of sorted wood waste is valued: 46% panel (of which England 90%), 20% energy.</p> <p>WKI evokes 55% of material recovery.</p>



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Austria	<p>Austria is similar to Finland in that forestry and wood processing industries form central elements of its economy. However, compared to Finland, the share of wood used for pulp and paper production is lower and the energy use of wood is higher. The share of black liquor of the total energy production is about 15%. Moreover, the use of the Austrian forest resources is close to its maximum sustainable level, and thus in order to increase the wood use, more efficient management of the resources, recycling and cascade use, would need to be emphasised.</p> <p>Since 1991, all municipal waste and various types of waste (including wood waste) incineration plants have been connected to heating networks.</p> <p>The ban of waste with an organic carbon content > 5 % (weight) from landfilling implies that all wood waste has to be either reused/recycled or, if a reuse/recycling is not possible or too expensive, burned in designated heating or combined heat and power plants. The recycling wood ordinance was prepared with the aim to increase the recycling rate of wood waste (i.e. to increase the share of wood waste that is reused in new products), in line with the hierarchy of waste management of the waste directive.</p> <p>In 2010, incineration represents an energy production for district heating of 26 000 GWh, of which 8 500 of RDF, which contain 85% of wood waste.</p> <p>Austria also uses wood waste in the panel industry and imports part of it, mainly from Germany.</p>
Italy	<p>As in Flanders, Italy has set up a system of green certificates: a minimum share of renewable energy in the production of energy is imposed. The producer pays a tax if the green energy rate is not high enough.</p> <p>Since 1 January 2012, Italy has prohibited the landfilling of combustible waste with a calorific value greater than 13 MJ / kg. Italy is one of the three European countries that started early on the road to the end of waste status for high-quality CSR. The country has early also introduced a CSR standard: UNI 9903.</p> <p>Italy has set up a system of efficient collecting of wood waste, through RILEGNO, but also through private companies linked to panel industry. The presence of an important panel industry has oriented wood waste towards recycling. According to WKI, material recovery reaches 89% in Italy.</p>



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