BIOENERGY EUROPE

STATISTICAL REPORT 2019

REPORT BIOMASS SUPPLY

Bioenergy EUROPE

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CONTENTS

Index

List of figures

List of tables

STATISTICAL REPORT

TIMELINE

Every year since its debut release in 2007, Bioenergy Europe's Statistical Report has provided an in-depth overview of the bioenergy sector in the EU-28 Member States.

Bioenergy Europe's Statistical Report has been enriched each year with new figures and information, collecting unique data on the developments of the European bioenergy market from a growing number of international contributors.

Bioenergy Europe is therefore able to develop a detailed report that helps industry leaders, decision makers, investors and all bioenergy professionals to understand the situation of bioenergy in Europe.

With more than 150 graphs and figures, readers of Bioenergy Europe´s Statistical Report can get accurate and up-to-date information on the EU-28 energy system such as the final energy consumption of biomass for heat and electricity, the number of biogas plants in Europe, the consumption and trade of pellets, the production capacity of biofuels and other key information to help break down and clarify the complexity of a sector in constant evolution.

In 2017, the Report was rewarded by the European Association Awards for being the "best Provision of Industry Information and Intelligence", a recognition after a decade of collective work.

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2019

ABOUT

OUR ACTIVITIES

Bioenergy Europe carries a wide range of activities aimed at supporting its members by informing them about latest EU and national policy developments, and by voicing their concerns to EU and other authorities. These include advocacy activities in key policy areas as well as the organisation of dedicated working groups acting as platforms where members can discuss common issues and exchange information on the state of play of bioenergy.

There are currently 7 active working groups:

- Agrobiomass & Energy Crops
- Biopower & CHP
- Competitiveness
- Domestic Heating
- Sustainability
- Pellets
- Wood Chips

In addition, Bioenergy Europe conceives and deploys targeted publications and communication campaigns to inform and educate about the potential of bioenergy for a decarbonised Europe.

Most notably, the association has several years of experience in data collection on the evolution of the bioenergy market and produce unique and tailored analyses along the year.

Thanks to the experience and authority acquired over the last 19 years, Bioenergy Europe successfully established two international certification schemes to guarantee high quality standard for fuels.

Bioenergy Europe is also the umbrella organisation of the European Pellet Council (EPC) and the International Biomass Torrefaction Council (IBTC). These networks have been created thanks to the dynamics of Bioenergy Europe members. Today, these networks bring together bioenergy experts and company representatives from all over Europe.

EUROPEAN PELLET COUNCIL
A NETWORK OF BIOENERGY EUROPE

The European Pellet Council (EPC) is an umbrella organisation of Bioenergy Europe founded in 2010, representing the interests of the European wood pellet sector. Its members are national pellet associations or related organisations from 18 countries.

The EPC is a platform for the pellet sector to discuss the issues related to the transition from a niche product to a major energy commodity. These issues include the standardisation and certification of pellet quality, safety, security of supply, education and training, and the quality of pellet-using devices.

EPC is managing the EN*plus*® quality certification.

www.pelletcouncil.eu
www.enplus-pellets.eu

INTERNATIONAL BIOMASS TORREFACTION COUNCIL
A NETWORK OF BIOENERGY EUROPE

The International Biomass Torrefaction Council (IBTC) is an umbrella organisation of Bioenergy Europe launched in 2012 and aims to building the first platform for companies having common interests in the development of torrefied Biomass markets. Currently, the IBTC initiative is supported by more than 23 companies active worldwide.

IBTC's objective is to promote the use of torrefied biomass as an energy carrier and to assist the development of the torrefaction industry. In this respect, IBTC's key activities are to undertake studies or projects, and to commonly voice its members' concerns to third parties to help to overcome barriers of market deployment.

www.ibtc.bioenergyeurope.org

ABOUT

BIOENERGY EUROPE

Bioenergy Europe is the common voice of the bioenergy sector with the aim to develop a sustainable bioenergy market based on fair business conditions.

Bioenergy Europe is a non-profit Brussels-based international organisation founded in 1990 which brings together national associations and companies from all over Europe – thus representing more than 4000 indirect members, including mainly companies and research centers.

www.bioenergyeurope.org

ASSOCIATIONS

ACADEMIA

ABOUT

BIOENERGY EUROPE

COMPANIES

Members as of May 2019.

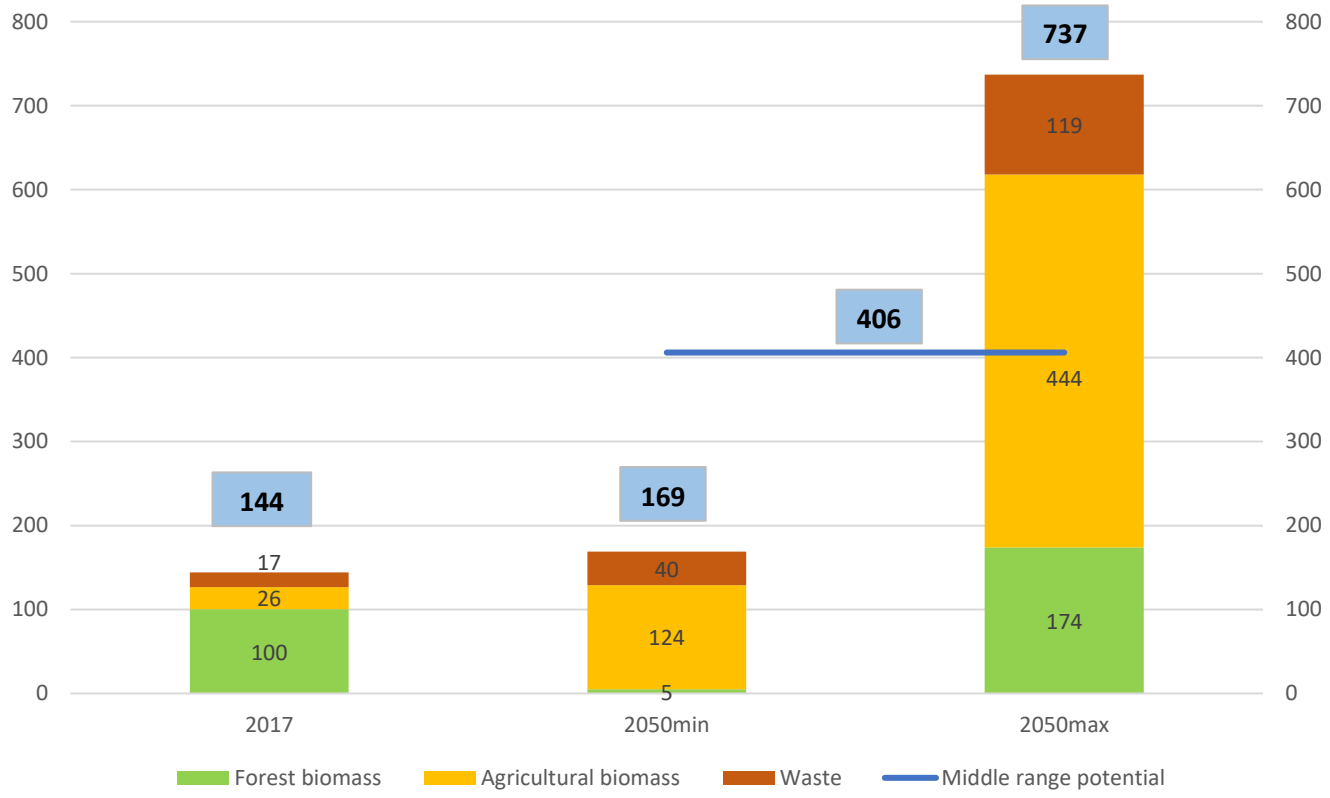
1. Overview

Biomass is any organic matters from plants or animals and is thus a renewable energy source. Biomass for energy can be in solid, liquid or gaseous form including or not fuel processing steps. Biomass can be collected from many sources as for examples:

- Forests, such as firewood or logging residues.
- By-products of the wood industry (e.g. bark, saw dust, shavings, black liquor).
- Energy crops (e.g. arable crops: cereal or oil based; perennial lignocellulosic crops: woody and grassy).
- Agricultural by-products (e.g. straw, manure, orchards pruning, pruning).
- Biomass from waste streams (e.g. municipal waste, animal by-products).
- By-products from agro-food industry.
- Aquatic biomass (algae).

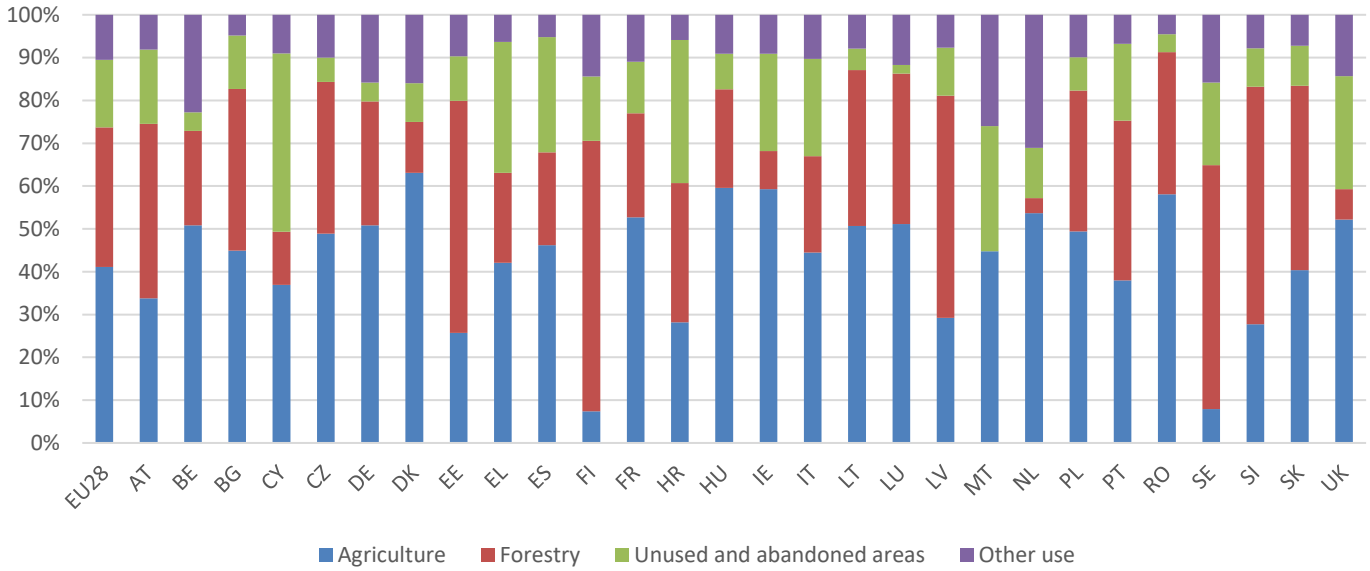
Existing studies have calculated the domestically available potential for biomass for energy to be between 169 and 737 Mtoe each year in Europe from 2050 onwards (Cf. figure 1). A literature review concludes that the middle range potential of 406 Mtoe, which is around 24% of the total energy consumption in EU-28 in 2017, can be achieved by 2050 – considering different constraints (e.g. costs). This means that, compared to the actual 144 Mtoe used in 2017, the potential gives enough room to almost triple the amount of bioenergy in the EU-28 energy mix.

Figure 1 Gross inland energy consumption of biomass in 2017 and potential in 2050 for the EU28 (in Mtoe)



Source: Bioenergy Europe, Faaij (2018), Securing sustainable resource availability of biomass for energy applications in Europe; review of recent literature.

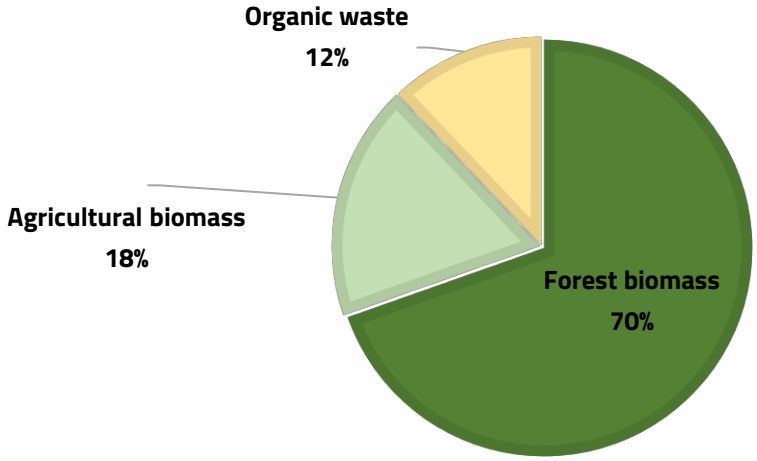
Figure 2 Land Use by type in EU28 2015 (%)



Note: Other use gathers services &residential areas, the industry related areas and fishing areas.
Unused and abandoned areas are defined in Annexes.
Source: Eurostat

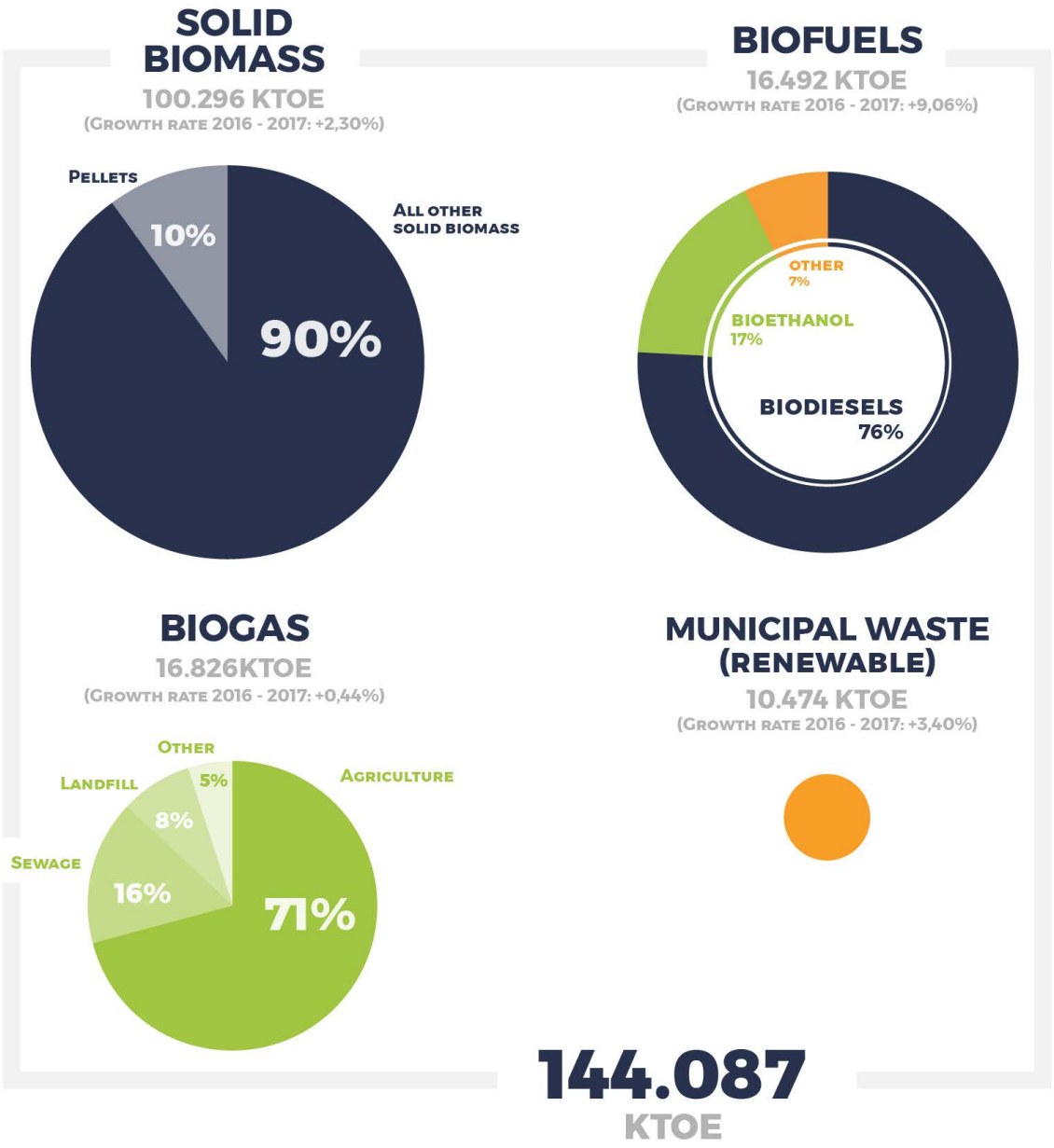
Unused and abandoned areas represent 15,8% of the total land use in the EU28 which is significant amount of land that could potentially be used to grow energy crops. Croatia, Greece, Spain or the United Kingdom present high percentages of unused and abandoned areas (>25%). Additionally, Cyprus and Malta also have high shares of unused and abandoned areas, but the absolute figure is rather small. In absolute terms the countries showing the biggest unused and abandoned area are Spain, Sweden, Italy, France and the United Kingdom. Regarding the forest area proportions within the total area, Finland, Sweden and Slovenia are the top three countries while, in absolute terms, the top 3 with the largest forest area are Sweden, Finland and France.

Figure 3 Distribution of the different biomass feedstock for energy in 2017 (%)



Source: Eurostat data and Bioenergy Europe's estimate

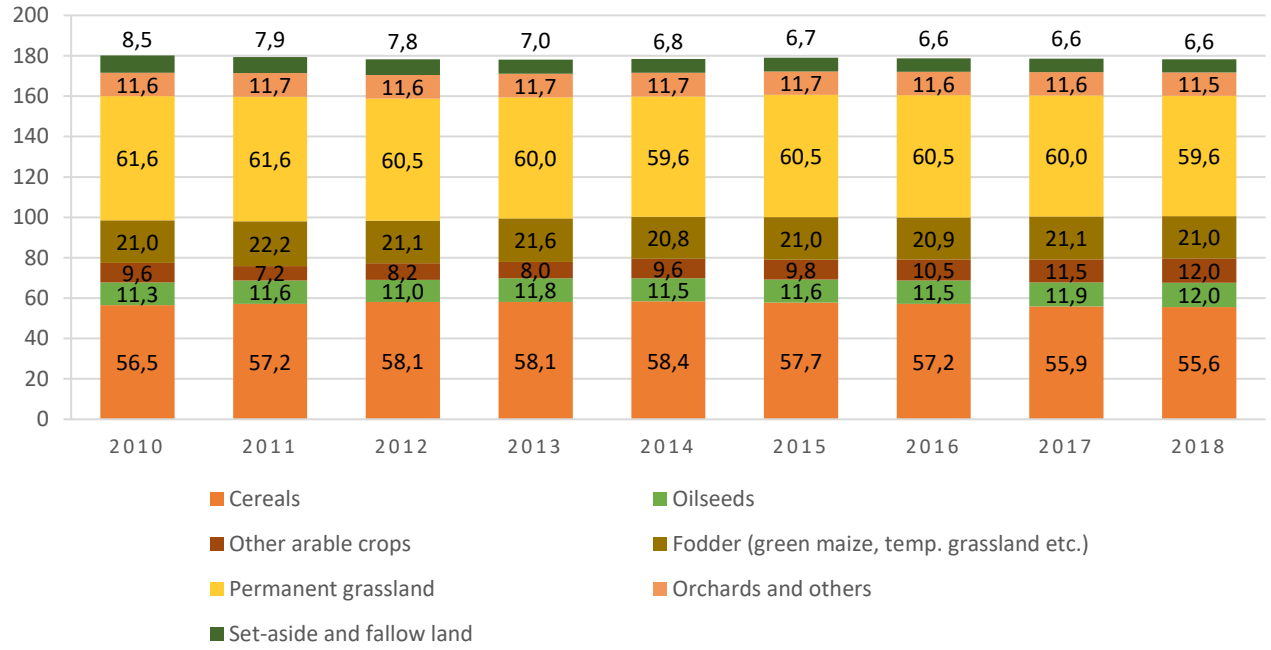
Figure 4 Gross inland energy consumption of biomass by type, use and source in the EU28 in 2017 (ktoe and %)



Source: Bioenergy Europe, EPC, Eurostat, EBA

2. Biomass from agricultural land and by-products

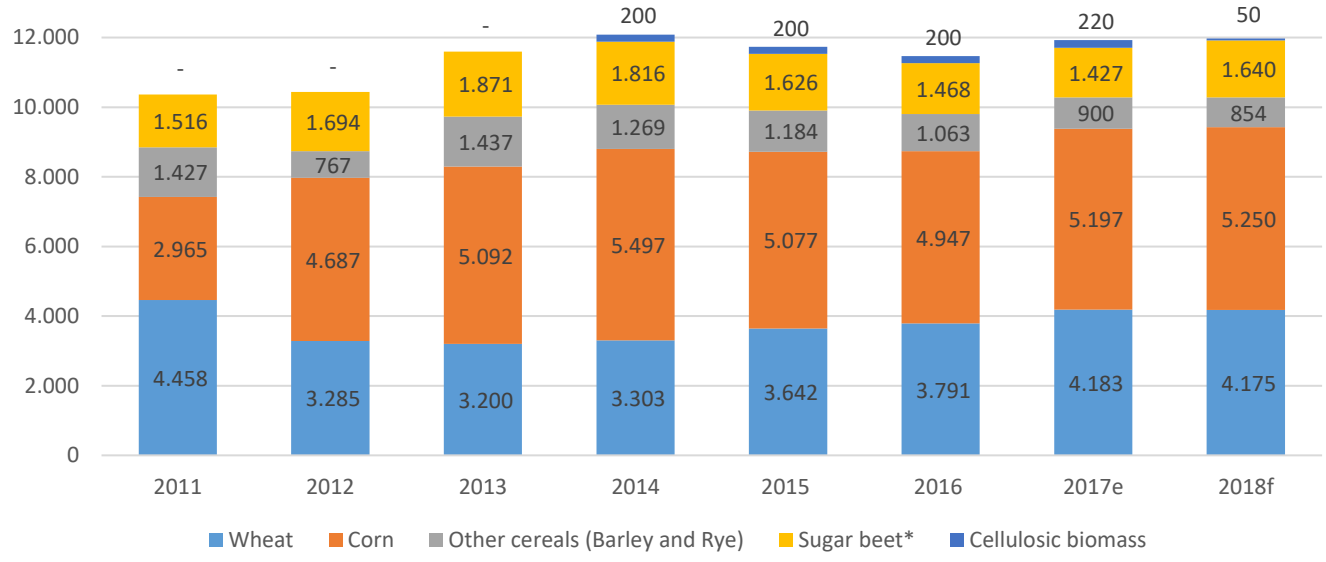
Figure 5 Evolution of the composition of EU28 agricultural land use (million ha)



Source: European Commission "Medium-term prospects for EU agricultural markets and income 2018-2030"

Since 2005 the total utilised agricultural area has decreased by 4,1% (7,7 million of hectares). This diminution is mainly observed in cereals. At the same time, oilseed dedicated area has increased by 3 million of hectares. The general decrease is explained by the increase of artificial lands (Cf. Annexes for definition) and of forest areas (Cf. part 3. Forest).

Figure 6 Evolution of bioethanol feedstock in EU28 (1000 tonnes – for sugar beet in tonnes of sugar equivalent)

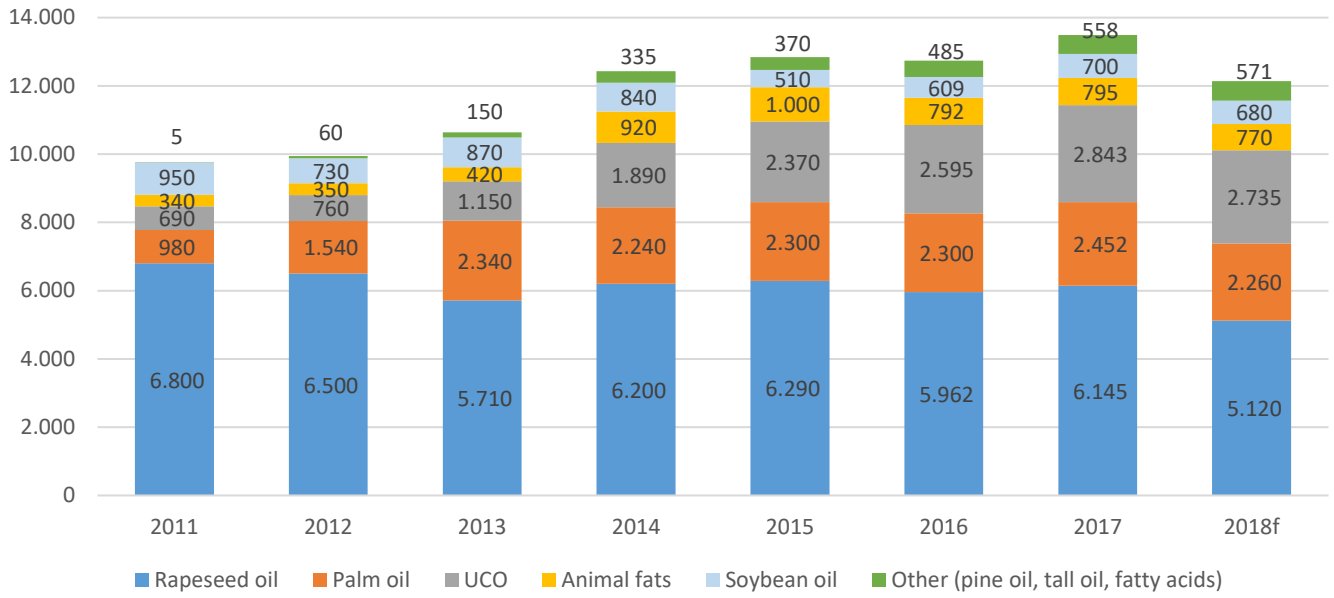


*In tonnes of sugar equivalent, calculated with the converting factor of 16% (average sugar content).

Note : e : stands for estimation, f for forecast

Source: USDA, EU Biofuels Annual 2018

Figure 7 Evolution of biodiesels feedstock in EU28 (1000 tonnes)



Note: UCO stands for used cooking oil
Source: USDA, EU Biofuels Annual 2018

For biodiesel production, the UCO contribution has increased in the last years even if for 2018 a small decrease is forecasted. Indeed, since 2011 it has quadrupled, enhancing to better value this product with a circular economy approach.

Table 1 Dedicated Energy crops in EU28 Member States (ha)

	Short Rotation Coppice (SRC)				Grassy energy crops			Total	Year	Sources
	Poplar	Willow	Other SRC	Total	Miscanthus	Other	Total			
EU28	**20.691**	**19.378**	**1.020**	**63.907**	**24.620**	**12.097**	**53.494**	**117.401**		
AT	977	244		**1.221**	1.078	52	**1.130**	**2.351**	2016	NREAP, Eurostat
BE		68	97	**165**	105	85	**190**	**355**	2012	NREAP
BG	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**3.286**	**3.286**	2016	NREAP
CY				**0**			**0**	**0**	2016	NREAP
CZ	2.869			**2.869**	200	190	**390**	**3.259**	2016	NREAP, BEECO and Eurostat
DE	n.a.	n.a.	n.a.	**6.600**	4.600	4.600	**9.200**	**15.800**	2016	NREAP, Eurostat
DK	n.a.	n.a.	n.a.	**8.896**	n.a.	n.a.	**66**	**8.962**	2016	NREAP
EE	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**	**n.a.**		
EL	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**11.010**	**11.010**	2016	Eurostat
ES	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**38**	**38**	2018	CEDER
FI	n.a.	n.a.	n.a.	**26**	n.a.	n.a.	**5.452**	**5.478**	2016	NREAP
FR	n.a.	n.a.	n.a.	**220**	3.000	n.a.	**3.000**	**3.220**	2016	ADEME
HR	n.a.	n.a.	n.a.	**n.a.**	500	n.a.	**500**	**500**	2016	BEECO
HU	3.352	505	247	**4.104**	1.000	n.a.	**1.000**	**5.104**	2016	NREAP, BEECO
IE		1.100		**1.100**	700	410	**1.110**	**2.210**	2016	Teagasc
IT	n.a.	n.a.	n.a.	**n.a.**	1.000	n.a.	**1.000**	**1.000**	2016	BEECO
LT	n.a.	n.a.	n.a.	**4.063**	n.a.	n.a.	**n.a.**	**4.063**	2016	NREAP
LU	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**211**	**211**	2016	NREAP
LV	221	442	3	**666**		253	**253**	**919**	2018	Latbio
MT				**0**			**0**	**0**	2016	NREAP
NL	n.a.	n.a.	n.a.	**13**	245		**245**	**258**	2016	NREAP
PL	9.000	7.832		**16.832**	992		**992**	**17.824**	2016-2018	Polbiom
PT	n.a.	n.a.	n.a.	**n.a.**	n.a.	n.a.	**n.a.**	**n.a**		
RO	2.600	600		**3.200**	600	2.530	**3.130**	**6.330**	2016	NREAP, Eurostat
SE	1.672	8.587	673	**10.932**		691	**691**	**11.623**	2016	NREAP
SI	n.a.	n.a.	n.a.	**n.a.**	400	n.a.	**400**	**400**	2016	BEECO
SK	n.a.	n.a.	n.a.	**n.a.**	200	n.a.	**200**	**200**	2016	BEECO
UK	n.a.	n.a.	n.a.	**3.000**	10.000	n.a.	**10.000**	**13.000**	2016	DEFRA
UA	n.a.	n.a.	n.a.	**n.a.**	1.500	n.a.	**1.500**	**1.500**	2018	BEECO

Dedicated energy crops are a promising form of bioenergy (Cf. figure 1). They have very low input requirements and short carbon cycles, provide ecosystem services and contribute to climate change mitigation. Because of these attractive characteristics, dedicated energy crops are bioenergy feedstocks with significant potential for growth.

However, current land use in the EU for the production of dedicated energy crops is still marginal (Bioenergy Europe estimates 117.401 ha of lignocellulosic crops i.e around 0,03% of EU28 land area) and the statistics on this topic are incomplete. Bioenergy Europe has therefore developed its own data collection, displayed in table 1. The figures in this table are either extracted from the National Renewable Action Plan Progress Reports (2015-2016) or, when no official data were available, they were collected from market-based estimations or companies' questionnaires. Additionally, few of them (for the total of grassy energy crops) are from Eurostat. This table is focusing mainly on lignocellulosic crops, i.e. oil, sugar and starch crops grown for energy purposes are not included even though sometimes the division is not clearly stated in the sources (Eurostat). Eurostat was used only for energy crops n.e.c. (not elsewhere classified, definition in Annexes).

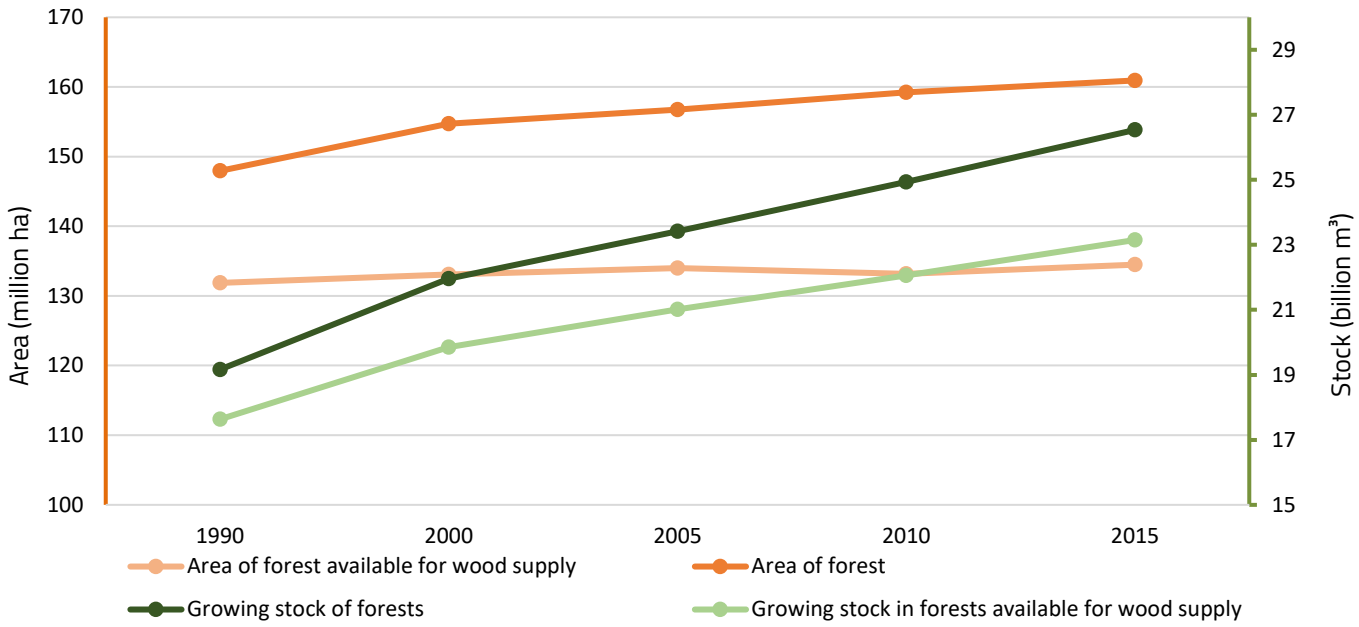
Additionally, figures are not always available, and hence this table does not strictly reflect the field reality and is probably still underestimating the area dedicated to energy crops. Indeed, when only part of the culture is dedicated to energy uses and the crops are therefore not registered as "dedicated" energy crops but plantations with several final uses (e.g. Eucalyptus in Spain), data collection becomes complex. Forward-looking decision making needs to be grounded on quantitative findings – the current lack of data can thus hamper this process. For this reason, this data collection is crucial and will allow to develop coherent policies to promote energy crops.

3. Biomass from forestry

In 2015[1] the EU28 had approximately 182 million hectares of forests and other wooded land, corresponding to 42 % of its land area. This is roughly equivalent to the land area used for agriculture in the EU. Out of these 182 million hectares, 161 are forest, with the forest area available for wood supply amounting to 134 million hectares.

The area covered by forests and other wooded land in the EU28 is currently increasing. In the period from 1990 to 2015, the area of forest cover and other wooded land in the EU28 increased by 5,2 %, equivalent to a yearly average increase of 0,2%.

Figure 8 Evolution of total area (left axis) and available stock (right axis) of forest and forest available for wood supply in EU28 (million hectares and billion m³)



Note: Definition of Growing stock and forest available for wood supply in Annexes.
Source: Eurostat

EU28 forests have been growing over the past decades. In 1990, European forests represented a total of 19,2 billion m³, meaning that the forest stock has increased by 38% over the last quarter century. This growth can be attributed to two main reasons:

(1) Forest areas increasing: according to Eurostat, EU-28 forest coverage gained on average 519.000 hectares every year from 1990 to 2015, meaning that European forests are increasing by the size of 1,4 football fields every minute.

(2) Increase in standing volume: on average, about 68% of the annual forest increment in Europe is felled, meaning that 32% of this annual increment remains in forests.

Additionally, the overall density is rising as well, from 130 m³/ ha in 1990 to 165 m³/ha in 2015 (considering the forest area and growing stock) as the growing stock is increasing at a higher rate than forest area.

[1] The most recent year in which statistics were available for forest resources at a European level. These statistics are collected every 5 years.

In 2015, 7 of the EU28 Member States had at least half of their land area covered by forests and other wooded land (Portugal, Spain, Latvia, Estonia, Slovenia, Sweden and Finland). In Finland and Sweden, the forest area accounts for approximately three quarters of the land area.

Table 2 Forest area in the EU28 Member States, 2015 (1000 hectares)

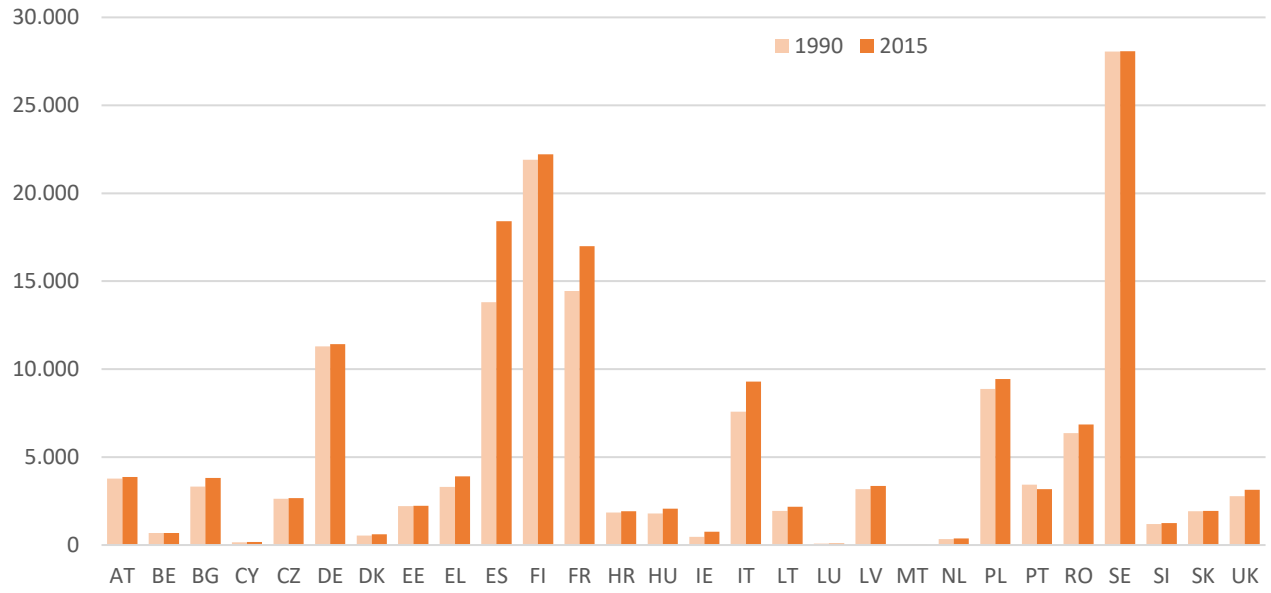
	Total land area	Total area of forests and other wooded land	Forests	Forests available for wood supply	Other wooded land
EU28	436.936	181.918	160.931	134.486	20.987
AT	8.394	4.022	3.869	3.339	153
BE	3.067	719	683	670	36
BG	11.100	3.845	3.823	2.213	22
CY	925	386	173	41	213
CZ	7.887	2.667	2.667	2.301	0
DE	35.833	11.419	11.419	10.888	0
DK	4.316	658	612	572	45
EE	4.535	2.456	2.232	1.994	224
EL	13.191	6.539	3.903	3.595	2.636
ES	49.850	27.627	18.418	14.711	9.209
FI	33.755	23.019	22.218	19.465	801
FR	54.906	17.579	16.989	16.018	590
HR	5.654	2.491	1.922	1.740	569
HU	9.301	2.190	2.069	1.779	121
IE	7.060	801	754	632	47
IT	30.129	11.110	9.297	8.216	1.813
LT	6.541	2.284	2.180	1.924	104
LU	260	88	87	86	1
LV	6.552	3.468	3.356	3.151	112
MT	32	0	0	0	0
NL	3.782	376	376	301	0
PL	31.385	9.435	9.435	8.234	0
PT	8.885	4.907	3.182	2.088	1.725
RO	23.907	6.951	6.861	4.627	90
SE	44.990	30.505	28.073	19.832	2.432
SI	2.028	1.271	1.248	1.139	23
SK	4.903	1.940	1.940	1.785	0
UK	24.776	3.164	3.144	3.144	20

Source: Eurostat

The change in forest area from 1990 to 2015 varied substantially between EU28 Member States. Among the 28 countries, Portugal was the only country whose forest area decreased slightly. Forest fires are one of the reasons behind this area reduction – Portugal being one of the European countries most affected by forest fires in the last decades. Forest fuel and forest management in general are key to prevent forest fires that damage the ecosystem and release high amounts of carbon dioxide in the atmosphere and thus contribute to climate change.

In other countries such as Belgium, Cyprus, Luxembourg, Malta, Slovakia or Sweden, almost no change was observed. Increases ranging from of 10 % to 25 % were observed in Bulgaria, Denmark, Greece, Spain, France, Italy, Lithuania, Hungary and the United Kingdom, while Ireland recorded a 62% increase during these 25 years.

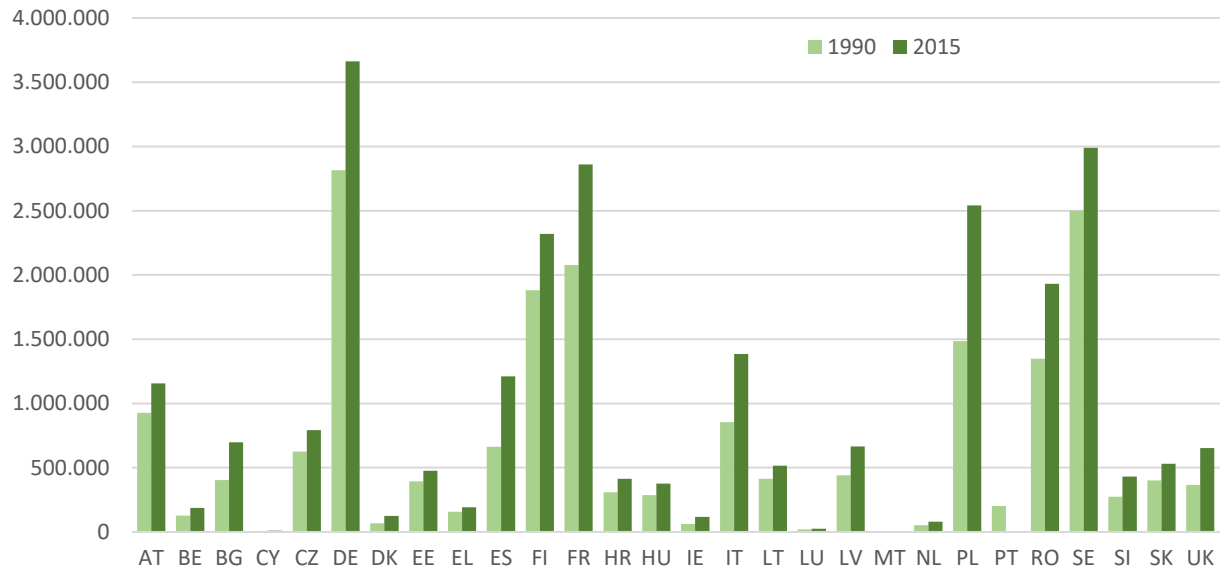
Figure 9 Evolution of forest area in EU28 Member States between 1990 and 2015 (1000 hectares)



Source: Eurostat

The total forests stock in the EU28 amounted to around 26,5 billion m^3 in 2015. Germany had the highest share (13,8 %), followed by Sweden (11,3 %) and France (10,8%).

Figure 10 Evolution of available stock of forest in EU28 Member States between 1990 and 2015 (1000 m^3)



Source: Eurostat

Ownership of EU28 forests is divided into small family holdings, state-owned forests, and large estates owned by companies, which are often exploited by the forest and wood products industry. In total, around 60% of the EU28´s forests were privately owned in 2010. This percentage is highest (98,4%) in Portugal and lowest in Bulgaria (13,2%).

The high share of privately-owned forests, which are often small and dispersed among many forest owners, makes forest management a challenging proposition. Economic incentives play a major role to sustainable forest management. Bioenergy provides such an incentive by permitting the valorisation of low-quality wood such as tops, branches and early thinnings.

Table 3 Forest ownership in 2010 for EU28 Member States (1000 ha)

	In public ownership	In private ownership	% of private ownership
EU28	63.044	94.995	60%
AT	878	2.527	74%
BE	317	364	53%
BG	3.286	451	12%
CY	119	54	31%
CZ	2037	621	23%
DE	5.932	5.477	48%
DK	139	448	76%
EE	923	1.038	53%
EL	2.907	845	23%
ES	5.333	12.855	71%
FI	6.744	15.474	70%
FR	4.064	12.360	75%
HR	1.376	544	28%
HU	1.178	853	42%
IE	386	339	47%
IT	3.032	5.996	66%
LT	1.333	837	39%
LU	41	46	53%
LV	1.755	1.594	48%
MT	0	0	n.a.
NL	181	192	51%
PL	7.643	1.686	18%
PT	98	3.141	97%
RO	4.363	2.152	33%
SE	6.822	21.192	76%
SI	315	932	75%
SK	974	786	45%
UK	868	2.191	72%

Source: Eurostat

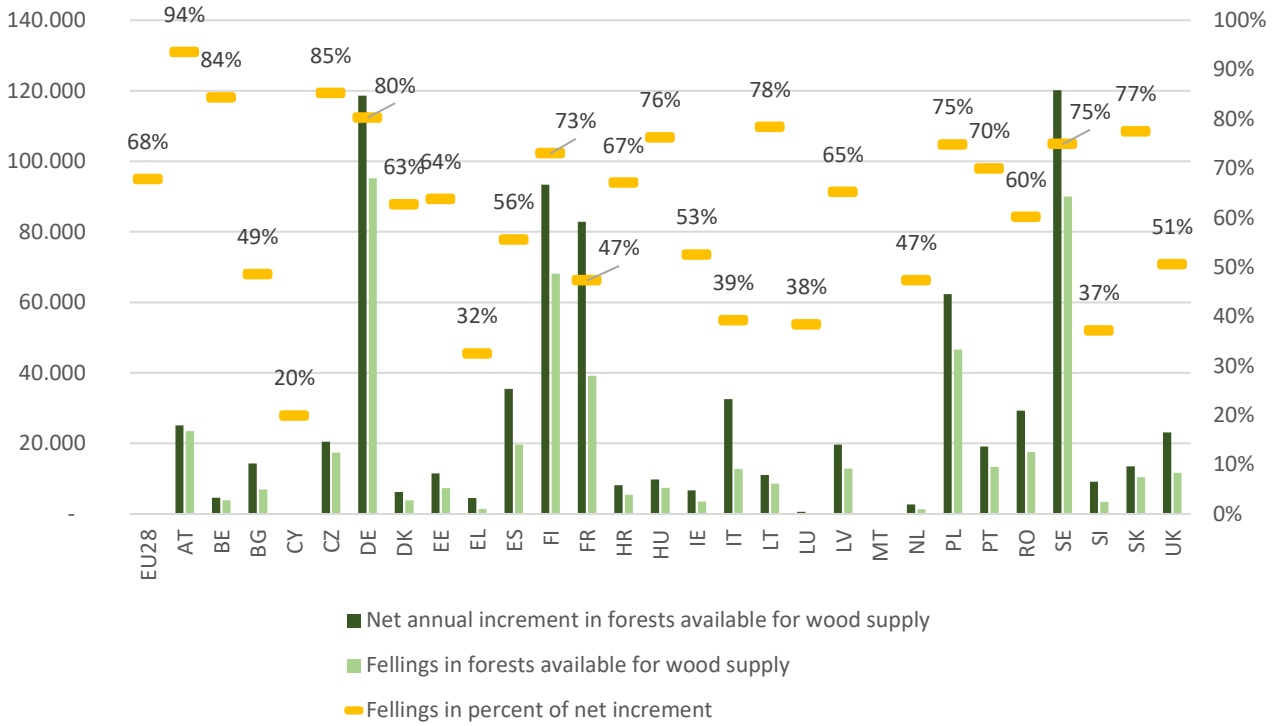
Table 4 Certified areas PEFC and FSC in the EU28 Member States (in 1000 ha) - Data from December 2018 for PEFC and April 2019 for FSC

	PEFC	% of the forest available for wood supply	FSC	% of the forest available for wood supply
EU28	71.066	53%	36.388	27%
AT	2.669	80%	0,6	0%
BE	301	45%	28	4%
BG	0	0%	1.462	66%
CZ	1.737	75%	61	3%
DE	7.572	70%	1.357	12%
DK	274	48%	215	38%
EE	1.242	62%	1.516	76%
ES	2.209	15%	280	2%
FI	18.038	93%	1.623	8%
FR	8.033	50%	60	0,4%
HR	0	0%	2.049	118%
HU	0	0%	304	17%
IE	376	60%	447	71%
IT	819	10%	66	1%
LU	35	41%	23	27%
LV	1.707	54%	1.084	34%
NL	3	1%	168	56%
PL	7.156	87%	6.954	84%
PT	269	13%	434	21%
RO	0	0%	2.839	61%
SE	15.928	80%	13.371	67%
SI	0	0%	263	23%
SK	1.224	69%	149	8%
UK	1.475	47%	1.637	52%

Note: Croatia shows more than 100% of its forest available for wood supply areas certified FSC according to this table, this statistical mismatch can be explained by the fact that Eurostat data are for 2015 while FSC data are for 2019, or because of disparity in the classification of forest area and forest available for wood supply area.
Source: PEFC & FSC

53% of EU28 forest areas available for wood supply are certified PEFC and 27% are certified FSC (some forests may be certified both PEFC and FSC). This represents a substantial proportion of forest owners who, by certifying their forests, demonstrate commitment to sustainable forest management. PEFC and FSC certification will also contribute to a solid proof of sustainability of woody biomass in the context of the REDII sustainability criteria.

Figure 11 Increment and fellings in forest available for wood supply (1000 m³) and percentage of fellings compared with net increment per EU28 Member States in 2010 (%)



Source: Eurostat and Swedish Forest Inventory

The felling rate for EU28 is 68% which means that 32% of the annual forest increment remains in the forest. As already showed, forest is thus growing in EU28. For some countries such as Austria or Czech Republic the relatively high felling rate is linked with active forest management for climate adaptation to address climate-related disturbances such as bark beetle outbreaks.

Among EU Member States, Sweden produced the most roundwood (74,7 million m^3) in 2017, followed by Finland, Germany and France. The large majority of the roundwood removals (77,3 %) of EU28's in 2017 was used for industries either as sawn wood and veneers or for pulp and paper production.

In Sweden, Slovakia, Portugal, Ireland, Poland, Finland and Cech Republic more than 87 % of the total roundwood production was used as industrial roundwood in 2017. Examples of roundwood used for fuel are thinnings and low-quality roundwood (depending on the wood size, shape or knotholes).

Table 5 Wood removals from forests in EU28 Member States by assortment in 2017 (1000 m^3)

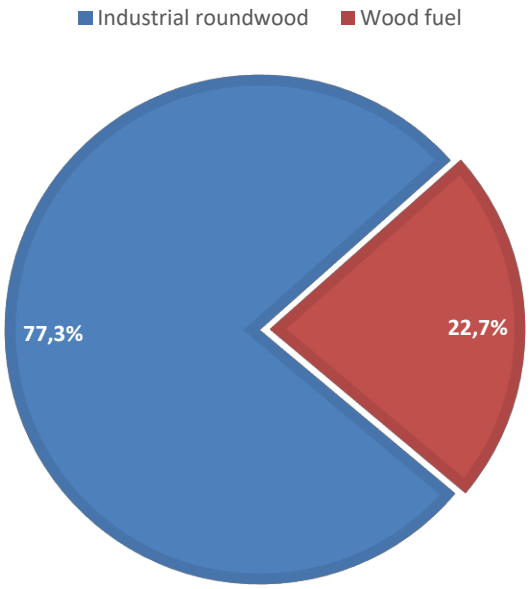
		Total roundwood		Industrial roundwood		
	Total Roundwood	Wood fuel	Industrial roundwood	Sawlogs and veneer logs	Pulpwood, round and split, all species	Other industrial roundwood
EU28	**473.211**	**107.262**	**365.949**	**203.782**	**152.195**	**9.972**
Growth rate (2016-2017)	2,0%	0,9%	2,4%	3,1%	1,3%	5,4%
AT	17.647	4.909	12.738	9.535	3.203	0
BE	5.412	893	4.519	2.965	1.381	173
BG	6.198	2.989	3.209	1.202	1.952	55
CY	16	14	2	2	0	0
CZ	19.387	2.376	17.011	11.488	5.429	94
DE	53.491	9.929	43.562	29.834	10.887	2.841
DK	3.842	2.061	1.781	1.070	381	330
EE	9.948	3.106	6.842	4.245	2.544	52
FI	63.295	7.964	55.330	24.472	30.859	0
FR	51.232	25.908	25.324	16.682	8.063	579
EL	1.432	1.065	367	304	0	63
HR	5.307	1.858	3.449	2.392	1.052	5
HU	5.586	2.636	2.950	1.130	949	872
IE	3.050	316	2.734	1.738	830	166
IT	12.928	10.839	2.089	1.120	682	287
LV	12.896	2.200	10.696	7.267	2.719	710
LT	6.795	2.015	4.780	3.584	1.196	0
LU	368	70	298	110	118	71
MT	0	0	0	0	0	0
NL	3.114	2.295	819	315	484	20
PL	45.346	5.247	40.099	17.879	21.228	992
PT	13.555	1.048	12.507	1.890	10.315	302
RO	15.500	4.849	10.651	8.684	1.008	960
SK	9.361	591	8.770	5.079	3.634	57
SI	4.509	1.039	3.470	2.495	908	67
ES	17.566	2.923	14.642	5.555	8.816	271
SE	74.670	6.200	68.470	36.007	31.962	500
UK	10.759	1.921	8.838	6.738	1.597	504

Note: Volume under bark. Total roundwood is the sum of Wood fuel and industrial roundwood. Industrial roundwood is the sum of sawlogs and veneer logs, pulpwood and other industrial roundwood.

The term "removal" differs from "felling" as it excludes trees that were felled but not removed.

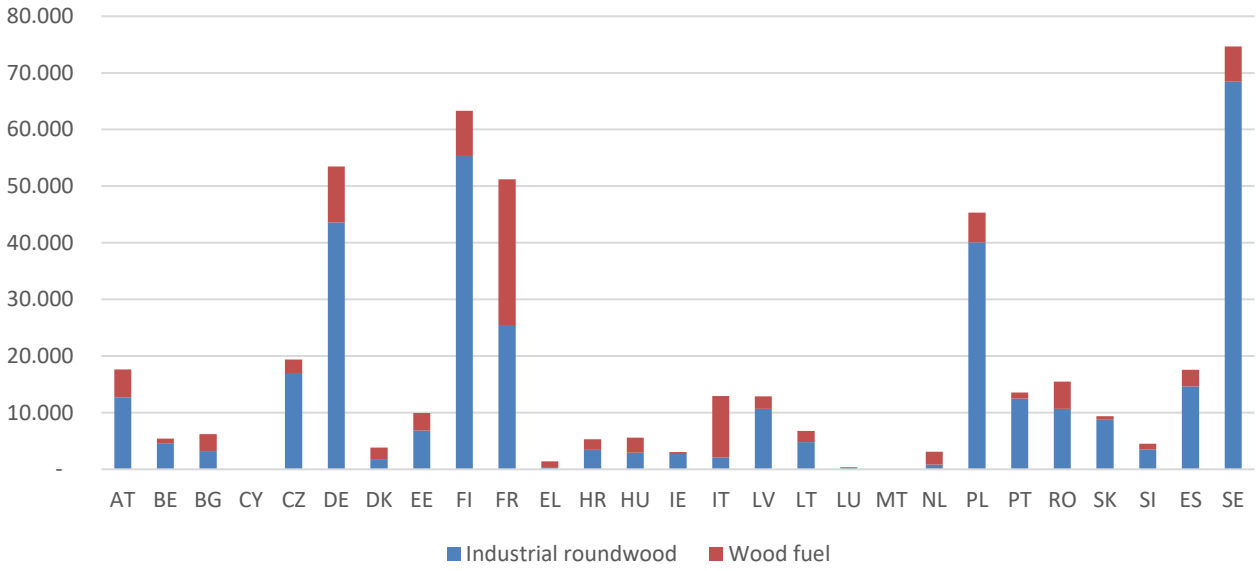
Source: FAOSTAT

Figure 12 Wood fuel and industrial wood proportion from forest removals within the EU28 in 2017 (%)



Source: FAOSTAT

Figure 13 Roundwood removals in EU28 Member States according to end use in 2017 (1000 m³)



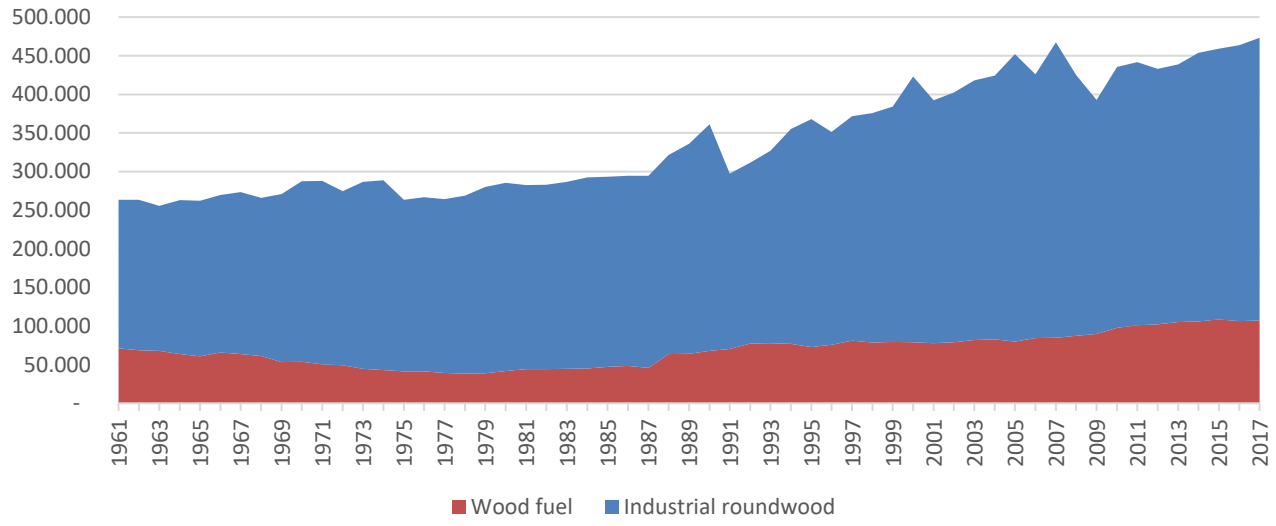
Source: FAOSTAT

Roundwood production is driven by demand from the wood products industry while bioenergy valorizes side streams. This trend is well explained by the substantial price difference between industrial roundwood, pulpwood and wood residues from sawmills, which ensures that high quality timber is used for high-value products such as furniture and construction. There is no market incentive for bioenergy producers to buy high-quality wood (i.e. sawlogs). Only low-value residues and other unmarketable wood are affordable for the energy sector.

Looking at the evolution of the roundwood production by type of end-use (figure 14), it can be clearly seen that the strong increase of bioenergy in the last decade did not drive roundwood production. The percentage of wood removal harvested for the purpose of wood energy slightly increased from 18,7% in 2000 to 22,7% in 2017. This remains around one fifth of the total harvest in the EU28, a proportion that has not changed significantly since the 1990s, even while consumption of bioenergy in Europe has more than tripled since then. More specifically, while the proportion of wood removals for energy remains relatively stable, the energy consumption from woody biomass has increased by 145% between 1990 and 2017 (from 41 Mtoe to 100 Mtoe - while the non-EU imports represents in 2017 just around 1% of the EU wood fuel production; Cf. table 6). This shows that the energy sector is not the main driver for forest owners to mobilise their forest resources, and that the bioenergy sector relies mainly on wood by-products and other types of biomass.

Additionally, the annual growth rate of the production for industrial roundwood is usually higher than the one for wood fuel, on average since 1961 this growth rate is around 1,4% for the first and 0,9% for the latter. This trend corroborates the idea that bioenergy is not the main driver for forest removals.

Figure 14 Stacked area of the evolution of roundwood production by type of end use in the EU28 (1000 m³)



Source: FAOSTAT

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Table 6 Roundwood trade in EU28 Member States in 2017 (1000 m³)

	Fuelwood (including wood for charcoal)				Industrial roundwood			
	Imports from non-EU countries	Total imports	Exports to non-EU countries	Total exports	Imports from non-EU countries	Total imports	Exports to non-EU countries	Total exports
EU28	**1.141**	**3.864**	**162**	**3.971**	**12.018**	**51.400**	**5.030**	**37.186**
Growth rate 2016-2017	-18,5%	-11,5%	-12,7%	-16,9%	-21,0%	-3,7%	13,1%	1,3%
AT	61	447	0	14	168	8.825	6	876
BE**	36	198	3	27	65	4.488	582	1.344
BG	0	1	13	172	1	14	73	295
CY	1	2	0	0	0	0	0	0
CZ	20	36	13	218	83	1.898	66	6.583
DE	157	394	3	134	969	8.681	882	3.963
DK	12	102	0	167	494	385	632	667
EE	1	18	54	267	0	218	328	2.557
EL**	33	189	0	6	9	436	9	41
ES	0	15	3	33	11	575	48	1.401
FI	6	11	3	61	4.135	4.830	65	916
FR	3	207	12	549	210	1.224	610	4.090
HR	57	61	3	745	2	57	20	291
HU	152	169	0	189	90	225	21	634
IE	0	4	0	2	0	363	0	80
IT	0	906	0	19	0	2.846	0	195
LT	11	47	4	165	344	493	179	1.473
LU	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
LV	10	32	34	348	168	1.229	524	2.652
MT	0	1	0	0	0	0	0	0
NL	11	70	0	4	5	241	18	465
PL	23	58	4	170	1.126	1.682	116	2.794
PT	0	8	6	13	29	2.000	232	478
RO	345	346	1	68	1.101	1.478	98	119
SE	37	158	6,41*	18	2.979	7.695	407,34*	778
SI	142	188	0	503	24	320	57	2.201
SK	13	107	0	60	2	820	37	1.955
UK	10	90	0	20	2	379	20	337

*data from 2016

**data from 2015

Source: Eurostat

Looking just at the import-export from non-EU-countries (total imports include intra-EU trades), EU28 is a net importer of wood fuels, but these imports account for just around 1% of the total wood fuel production in the EU.

4. Biomass from waste

Waste constitutes the third main source of biomass for energy. Waste can have several origins and categories (sewage, animal residues, vegetal residues etc.) but here the focus is on municipal waste and its renewable parts.

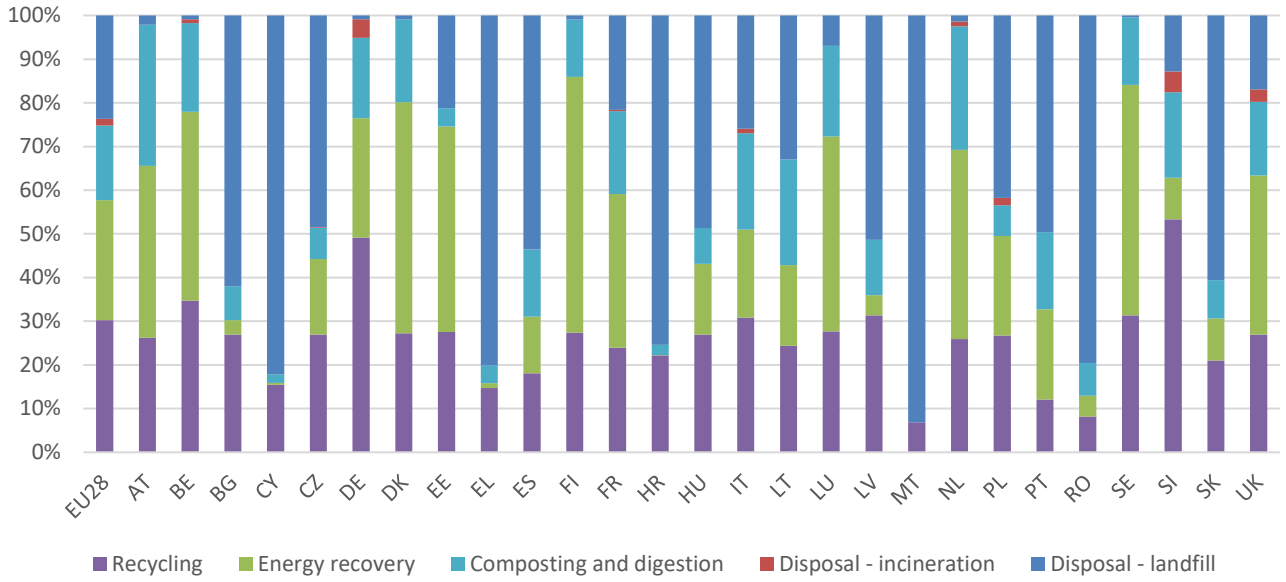
Table 7 Municipal waste (renewable and not renewable) by waste operation in EU28 Member States, 2017 (1000 tonnes)

	Total municipal waste generated (renewable and not renewable)	Waste treatment	Disposal - landfill	Disposal - incineration	Energy recovery	Recycling	Composting and digestion
EU28	**248.653**	**245.191**	**57.624**	**3.824**	**67.040**	**73.669**	**41.631**
Growth rate (2016-2017)	0,20%	0,20%	-3,80%	-33,60%	5,30%	0,90%	1,20%
AT	5.018	4.944	103	0	1.944	1.296	1.601
BE	4.659	4.620	41	38	1.964	1.580	924
BG	3.080	3.071	1.903	0	103	827	238
CY	547	505	414	0	2	78	10
CZ	3.643	3.643	1.765	5	630	982	261
DE	52.342	52.342	458	2.204	14.317	25.715	9.647
DK	4.503	4.503	38	0	2.380	1.228	857
EE	514	492	98	0	217	127	19
EL	5.415	5.415	4.335	n.a.	58	798	224
ES	21.530	21.530	11.537	0	2.780	3.900	3.312
FI	2.812	2.812	26	0	1.646	771	369
FR	34.393	34.393	7.424	115	12.105	8.232	6.516
HR	1.716	1.649	1.243	0	1	366	39
HU	3.768	3.752	1.825	0	608	1.010	309
IE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
IT	29.583	26.948	6.927	256	5.378	8.218	5.903
LT	1.286	1.275	421	0	236	311	308
LU	362	362	25	0	161	100	75
LV	851	737	231	n.a.	21	141	57
MT	283	261	244	0	0	18	0
NL	8.787	8.787	124	94	3.807	2.279	2.482
PL	11.969	11.969	5.000	198	2.724	3.199	848
PT	5.012	4.778	2.369	n.a.	988	576	845
RO	5.325	5.306	3.770	0	227	387	353
SE	4.551	4.551	20	0	2.400	1.426	704
SI	974	773	99	37	74	412	151
SK	2.058	2.057	1.246	0	197	433	181
UK	30.911	30.998	5.228	877	11.261	8.324	5.209

Note: Municipal waste is defined in Annexes.

Source: Eurostat

Figure 15 Municipal waste treatment in EU28 Member States by treatment in 2017 (%)

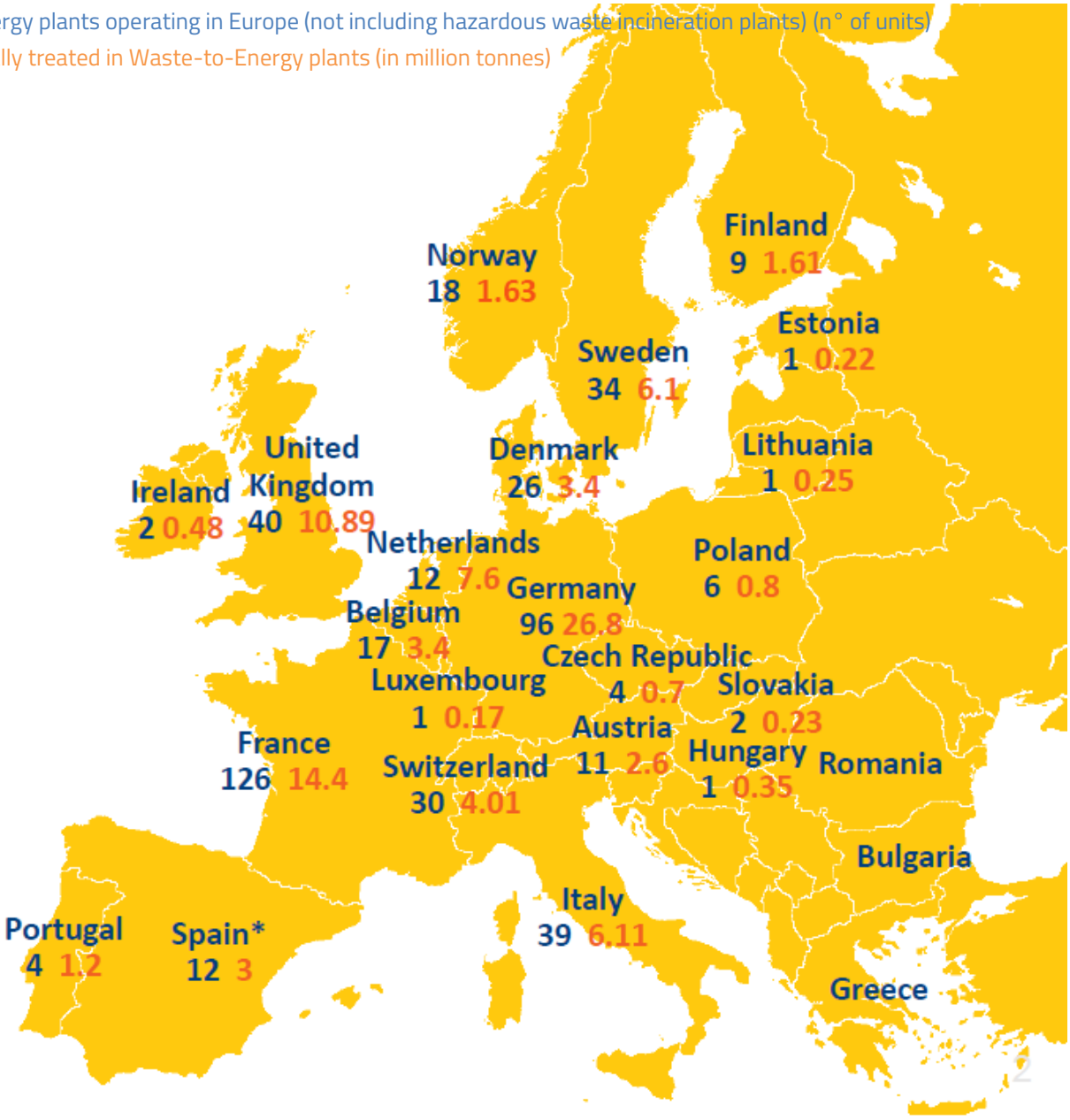


Source: Eurostat

Slovenia, Germany and Belgium showed the highest proportion of municipal waste recycling in 2017 (>34%). In Finland, Denmark and Sweden the energy recovery pathway is the main one, with more than 52% of the municipal waste treated. At the EU28 scale, recycling is the first pathway (30% of the municipal waste) followed by energy recovery (27%) and landfill disposal (24%). The volumes and proportions of municipal waste sent to landfill and to incineration (disposal) are decreasing in the last years while the pathways valuating waste are increasing their share. In the coming years, it is likely that composting and digestion will overtake the "landfill disposal" pathway and rank among the top 3 municipal waste treatments. Spain, France and Italy are, in absolute terms, the countries sending the most municipal waste to landfill (Cf. table 7).

Figure 16 Map of incineration plants in EU28 and mass of waste thermally treated in 2017

- Waste-to-Energy plants operating in Europe (not including hazardous waste incineration plants) (n° of units)
- Waste thermally treated in Waste-to-Energy plants (in million tonnes)



* Includes plant in Andorra

Source: CEWEP (Data supplied by CEWEP members unless national sources)

Table 8 Wood waste by waste operation in the EU28 Member States in 2016 (in 1000 tonnes)

	Wood waste treatment	Disposal - landfill	Disposal - incineration	Energy recovery	Recycling and backfilling
EU28	**48.460**	**450**	**1.010**	**23.260**	**23.740**
AT	2.060	0	n.a.	n.a.	1.725
BE	1.805	0,1	111	950	744
BG	308	0,6	0,5	186	121
CY	8	5,4	0	0,1	2,2
CZ	541	5,8	0	14	521
DE	11.050	n.a.	1,4	8.128	2.921
DK	331	2,2	0	50	278
EE	379	0,2	0	200	179
EL	13	0,4	0	5,2	7,3
ES	1.070	17,6	0	74	978
FI	3.287	0	3,2	3.161	123
FR	6.412	315	96	1.734	4.268
HR	18	1,1	0	4,6	12,7
HU	218	0,5	0,1	16	201
IE	128	4,3	0	42	82
IT	4.884	0,7	2,4	874	4.006
LT	97	1,6	0	16	79
LU	40	0	0	40	0,2
LV	13	4,4	0	6,7	2,3
MT	9	8,8	0	0	0
NL	2.277	49	2	1.323	903
PL	3.607	0	0,2	1.426	2.181
PT	129	1	0,2	4	124
RO	3.284	0,3	6	1.709	1.569
SE	2.100	0	46	2.032	22
SI	99	0	0	92	7,5
SK	331	2	0,1	222	106
UK	3.960	28	746	609	2.577

Source: Eurostat

Table 8 and 9 show that the volumes and treatments of waste (wood and animal & vegetal) vary significantly across the EU28. In 2016, the United Kingdom incinerated (disposal) a significant part of this waste compared to the other EU Member States – 19% for wood waste and 13% for animal & vegetal waste compared to 2% in average in the EU28 (for both categories). For the energy recovery treatment regarding wood waste, Germany, Finland and Sweden are the top 3 countries. More than 96% of the wood waste were valued through energy recovery in Finland and Sweden. The top 3 countries for wood waste treatment in general are Germany, France and Italy. For these two last countries the recycling and backfilling pathway was the main one used in 2016. For the animal and vegetal waste, the recycling and backfilling is by far the main pathway used in the different EU Member States.

Table 9 Animal and vegetal waste* by waste operation in the EU28 Member States in 2016 (in 1000 tonnes)

	Animal and vegetal waste treatment	Disposal - landfill	Disposal - incineration	Energy recovery	Recycling and backfilling
EU28	**76.480**	**1.680**	**1.710**	**4.300**	**68.790**
AT	1.946	0	n.a.	n.a.	1.935
BE	5.673	0,0	49	2	5.622
BG	931	466	5,8	51	408
CY	73	10,4	0	1,4	61,4
CZ	544	10,7	1	58	474
DE	15.174	2	n.a.	1.967	n.a.
DK	1.123	4,2	0	96	1.022
EE	113	0,6	0	0	112
EL	637	36,5	3	123,0	475,0
ES	1.746	51,1	0	74	1.621
FI	1.203	51	0,2	98	1.054
FR	8.044	593	22	433	6.997
HR	593	16,9	0	3,9	571,8
HU	766	6,8	0,8	293	465
IE	355	0,8	0	39	316
IT	6.777	7,5	6,0	123	6.641
LT	249	4,5	1	1	242
LU	135	0	0	0	135,1
LV	222	37,8	0	20,9	162,8
MT	12	6,6	5	0	0
NL	15.194	32	488	466	14.208
PL	2.774	3	52,8	60	2.659
PT	111	10	2,8	5	93
RO	727	44,8	32	69	581
SE	2.406	0	1	106	2.299
SI	242	0	0	11	231,1
SK	1.031	7	19,2	56	949
UK	7.682	283	1.002	129	6.268

* Including mixed food waste

Source: Eurostat

Table 10 Gross inland energy consumption of waste by type in the EU28 Member States in 2017 (in ktoe)

	Renewable municipal waste	Industrial waste (non-renewable)	Non-renewable municipal waste
EU28	**10.474**	**4.056**	**10.593**
Growth rate (2016-2017)	3,4%	-7,8%	3,4%
AT	187	463	287
BE	376	289	365
BG	32	23	12
CY	18	2	19
CZ	92	244	61
DE	3.217	1.297	3.217
DK	521	0	426
EE	0	0	72
EL	0	0	0
ES	260	0	260
FI	327	48	242
FR	1.391	101	1.391
HR	0	12	0
HU	66	110	53
IE	103	0	126
IT	853	281	853
LT	29	4	29
LU	14	14	23
LV	20	3	23
MT	0	0	0
NL	965	0	856
PL	92	531	344
PT	119	109	90
RO	2	90	3
SE	874	18	807
SI	0	51	0
SK	29	181	24
UK	887	185	1.008

Note: Renewable municipal waste is defined in Annexes.
Source: Eurostat

5. Annexes

Definitions:

Artificial land cover is defined by Eurostat as:
- roofed built-up areas including buildings and greenhouses;
- artificial non built-up areas including sealed area features, such as yards, farmyards, cemeteries, car parking areas etc. and linear features, such as streets, roads, railways, runways, bridges;
- other artificial areas including bridges and viaducts, mobile homes, solar panels, power plants, electrical substations, pipelines, water sewage plants, and open dump sites.

Energy crops n.e.c. are crops exclusively used for renewable energy production not elsewhere classified and grown on arable land: miscanthus (Miscanthus giganteus), reed canary grass (Phalaris arundinacea), etc. These crops can vary depending on the country. With the change of agricultural policy, it is expected that new plants used exclusively for energy production will be taken into production. Areas of crops which are not used exclusively for renewable energy production (e.g. rape, green maize) are recorded under the respective headings (e.g. 'rape and turnip rape' in the case of rape used as an energy crop). As short rotation coppices do not belong to UAA, they are excluded.

Forest Growing stock is defined by FAO as: Volume over bark of all living trees more than X cm in diameter at breast height. Includes the stem from ground level or stump height up to a top diameter of Y cm, and may also include branches to a minimum diameter of W cm (where X, Y and W threshold must be provided by the countries).

Forest available for wood supply are forests where there are no environmental social or economic restrictions that could have a significant impact on the current or potential supply of wood. These restrictions could be based on legal acts, managerial owners' decisions or other reasons.

Municipal waste refers to renewable and non-renewable household waste and waste similar in nature and composition to household waste.

Renewable municipal waste is the portion of waste produced by households, industry, hospitals and the tertiary sector which is biological material collected by local authorities and incinerated at specific installations.

Unused and abandoned areas

Abandoned areas

This class consists of abandoned areas with signs or structures of previous use of any kind. Areas belonging to the abandoned class are not in use and can't anymore be used for the original purpose without major reparation/renovation work.

Unused areas

This class includes areas which are in natural / semi-natural state and no signs of any use are visible

Table 11 Country codes

EU28	European Union (28 members)
AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovak Republic
UK	United Kingdom

Table 12 Symbols and abbreviations

Symbol	Meaning
,	Decimal separator
.	Thousand
n.a.	Data not available

Table 13 Decimal prefixes

10^{1}	**Deca (da)**	10^{-1}	**Deci (d)**
10^{2}	**Hecto (h)**	10^{-2}	**Centi (c)**
10^{3}	**Kilo (k)**	10^{-3}	**Milli (m)**
10^{6}	**Mega (M)**	10^{-6}	**Micro (µ)**
10^{9}	**Giga (G)**	10^{-9}	**Nano (n)**
10^{12}	**Tera (T)**	10^{-12}	**Pico (p)**
10^{15}	**Peta (P)**	10^{-15}	**Femto (f)**
10^{18}	**Exa (E)**	10^{-18}	**Atto (a)**

Table 14 General conversion factor for energy

to from	1 MJ	1kWh	1 kg oe	Mcal
1 MJ	1	0,278	0,024	0,239
1 kWh	3,6	1	0,086	0,86
1 kg oe	41,868	11,63	1	10
1 Mcal	4,187	1,163	0,1	1

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