



Air France

Plane powered by biofuel



# + 10.1 %

The increase of biofuels consumption for transport in the European Union between 2017 and 2018 (in energy content)

## BIOFUELS BAROMETER

A study carried out by EurObserv'ER. 

In 2018, biofuel consumption for transport in the European Union experienced a two figure growth. According to EurObserv'ER, it reached 17 Mtoe in 2018, compared to 15.4 Mtoe in 2017, which represents an increase of 10.1%, in line with the increase in the incorporation mandates of certain Member States and a secure European legislative framework. Biodiesel, whether conventional (fatty acid methyl esters or FAME) or derived from hydrogenated vegetable oil (HVO), is the main beneficiary of this increase, with consumption increasing by nearly 1.5 Mtoe to reach 13.9 Mtoe in 2018.

# 82.0 %

Biodiesel part in the total biofuel consumption in EU transport in 2018 (in energy content)

# 17.0 Mtoe

Total biofuel consumption in EU transport in 2018

The European legislative framework for the development of biofuels has been clearly redefined, giving renewed visibility to the Member States and the industrialists involved in meeting the European Union's objectives. An initial step was taken in 2015 with the publication of the Directive 2015/1513/EU, known as "ILUC", with a view to taking better account of Indirect Land Use Change that adversely affects greenhouse gas savings (see box). A second amendment was implemented in late 2018 with the adoption of the new renewable energy directive (2018/2001/EU) called "RED II", which defines the roadmap up to 2030. This new framework provided a better structure for the growth of the sectors, which was illustrated in 2018 by good consumption figures. The formal target for 2020 has not been modified by the ILUC Directive: the renewable energy share in final energy consumption in the transport sector has remained at 10% for this period. On the other hand, "RED II" has raised this target to 14% by 2030 (a threshold described as the "minimum share" target), by reformulating and adding new sustainability and greenhouse gas reduction criteria (see insert) and by setting specific targets for biofuels derived from waste (oil or fat) or non-food crop raw materials. In order to reach the 14% target, the RED II Directive provides that the share of biofuels (and biogas) used for transport and produced from certain raw<sup>1)</sup> materials can be considered to be twice their energy content in the energy balance of the countries that will use them. This double counting approach concerns "advanced biofuels" (and biogas) as defined in article 2, which are produced from the raw materials listed in Part A of Annex IX of the Directive (algae, waste and residue from forestry and the wood sector, straw, manure, sewage sludge, crude glycerin, bagasse, etc.). It also applies to biofuels (and biogas) produced with other raw materials listed in Part B of this Annex, namely used cooking oils and animal fats. However, biofuels produced from these materials are not accepted as advanced and therefore are not part of the specific objectives of minimum shares allocated to advanced biofuels. In order to allow the industrial development of "advanced biofuels", RED II pro-

### Sustainability criteria

*RED II defines a series of sustainability and GHG emission criteria that bioliquids used in transport must comply with to be counted towards the overall 14% target and to be eligible for financial support by public authorities. Some of these criteria are the same as in the original Renewable Energy Directive, while others are new or reformulated. For liquid biofuels, the default GHG emission values and calculation rules are provided in Annex V. The greenhouse gas savings thresholds for biofuels in transport are 50% for plants with an operation start date before October 2015, 60% after October 2015 and will be 65% from January 2021. The European Union points out that while biofuels are important in helping the EU meet its greenhouse gas reduction targets, biofuel production typically takes place on cropland that was previously used for other agriculture such as growing food or feed. Since this agricultural production is still necessary, it may lead to the extension of agriculture land into non-cropland, possibly including areas with high carbon stock such as forests, wetlands and peatlands. This process is known as indirect land use change (ILUC). As this may cause the release of CO<sub>2</sub> stored in trees and soil, indirect land use change risks negating the greenhouse gas savings that result from increased biofuels. To address the issue of the ILUC effect, the revised Renewable Energy Directive (RED II) introduced a new approach. It sets limits on high ILUC-risk biofuels, bioliquids and biomass fuels with a significant expansion in land with high carbon stock. These limits will affect the amount of these fuels that Member States can count towards their national targets when calculating the overall national share of renewables and the share of renewables in transport. Member states will still be able to use (and import) fuels covered by these limits, but they will not be able to include these volumes when calculating the extent to which they have fulfilled their renewable targets. These limits consist of a freeze at 2019 levels for the period 2021-2023, which will gradually decrease from the end of 2023 to zero by 2030. The Directive also introduces an exemption from these limits for biofuels, bioliquids and biomass fuels certified as low ILUC-risk. As required by the directive, the Commission has adopted the Delegated Regulation (EU) 2019/807 of March 13, 2019 following a two-month period of scrutiny by the European Parliament and the Council. This delegated act sets out specific criteria for determining high ILUC-risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed and for certifying low ILUC-risk biofuels, bioliquids and biomass fuels.*

(source: <https://ec.europa.eu/jrc/en/jec/renewable-energy-recast-2030-red-ii>)

vides a specific target for each Member State of 0.2% by 2022, at least 1% by 2025 and at least 3.5% by 2030. However, the Directive allows States to derogate from these limits if they can justify issues related to the availability of the raw materials concerned. Other subsidies have also been introduced to promote the most efficient transport modes in terms of greenhouse gas emissions. The renewable electricity share is considered equivalent to four times its energy content when intended for road transport and can be considered

equivalent at 1.5 times its energy content when intended for rail transport. With the exception of fuels produced from food and feed crops, the contribution of fuels supplied for air and sea transport is 1.2 times their energy content. These subsidies therefore have the effect of reducing the physical volumes of incorporation of biofuels required to achieve the minimum 14% share by 2030.

<sup>1)</sup> The list of affected raw materials is set out in Annex IX of RED II.

RED II also set a cap for food and feed-based biofuels produced from crops (which can be defined as "agrofuel"). Their share in 2030 will be subject to a double constraint: not to exceed a maximum share of 7% of transport fuels in final energy consumption and their level may not be more than one percentage point higher than their rate in 2020. It is also possible, for

those Member States that so wish, to set a lower limit and make distinctions between biofuels. For example, Member States may set a lower limit for the share of biofuels produced from certain oil crops, taking into account the best available data on the impact of indirect land-use changes. RED II also introduced a limit for the contribution of biofuels or biogases produced from waste oils or

animal fats (Part B of Annex IX) capped at 1.7% by 2030. The objective, according to EurObserv'ER, is to leave more development scope for advanced biofuels that also benefit from double counting and to limit global imports (China, the US...) of used cooking oil and animal fats to the European market.

Tabl. n° 1

Biofuels consumption for transport in the European Union in 2017 (in ktoe)

Country	Bioethanol	Biodiesel	Biogas fuel	Total consumption	Of which advanced biofuel***	% compliant*
France	539.0	2 796.0	0.0	3 335.0	22.5	100.0%
Germany**	733.0	1 828.0	38.0	2 599.0	6.0	98.6%
Sweden	99.0	1 421.2	111.1	1 631.3	n.a.	100.0%
Spain	140.8	1 228.8	0.0	1 369.5	2.4	100.0%
Italy	33.1	1 028.7	0.1	1 061.9	6.8	99.9%
United Kingdom	403.4	590.9	2.7	997.1	n.a.	100.0%
Poland	176.2	428.7	0.0	604.9	0.0	100.0%
Austria	56.0	410.6	0.3	466.9	0.8	96.0%
Belgium	86.7	378.5	0.0	465.1	1.1	100.0%
Finland	80.7	310.0	0.3	391.1	n.a.	100.0%
Czechia	75.1	244.1	0.0	319.2	0.0	100.0%
Netherlands	129.0	177.2	5.4	311.5	n.a.	97.3%
Romania	91.1	206.2	0.0	297.2	0.0	100.0%
Portugal	2.9	252.2	0.0	255.1	0.0	100.0%
Denmark	0.0	260.0	0.3	260.3	n.a.	84.0%
Greece	0.0	165.9	0.0	165.9	0.0	100.0%
Bulgaria	26.7	139.6	0.0	166.2	0.0	100.0%
Ireland	29.6	131.0	0.0	160.6	0.0	100.0%
Slovakia	19.6	129.9	0.0	149.5	0.0	100.0%
Hungary	40.0	108.4	0.0	148.4	0.0	100.0%
Luxembourg	6.8	103.5	0.0	110.3	0.0	100.0%
Lithuania	8.2	63.5	0.0	71.7	0.0	100.0%
Slovenia	8.6	34.7	0.0	43.3	0.0	100.0%
Latvia	7.9	1.4	0.0	9.3	0.0	100.0%
Cyprus	0.0	8.7	0.0	8.7	0.0	100.0%
Malta	0.0	7.3	0.0	7.3	0.0	100.0%
Estonia	1.0	0.0	0.0	1.0	0.0	100.0%
Croatia	0.2	0.3	0.0	0.5	0.0	100.0%
<b>Total EU 28</b>	<b>2 794.3</b>	<b>12 455.2</b>	<b>158.3</b>	<b>15 407.7</b>	<b>n.a.</b>	<b>99.3%</b>

\* Compliant with Articles 17 and 18 of Directive 2009/28/EC  
 \*\* Germany consumption figures include consumption of 1 ktoe of pure vegetable oil.  
 \*\*\* Defined as according to art 2 of the RED II. Due to lack of data for several countries, the total has not been calculated.  
 Source: EurObserv'ER 2019

## 17 MTOE OF BIOFUELS CONSUMED IN 2018 IN THE EU

After a long dryspell, EU biofuel consumption has entered a new period of dynamic development over the last two years (Graph 1). Taking into account the energy content, not the volume (the energy density variant according to the type of

biofuel), the overall biofuel consumption increased by 10.1% between 2017 and 2018 to 16,959 ktOE (+1,551 ktOE - see Table 1 and 2). It should be noted that almost all of this consumption complies with the sustainability requirements defined by the European Commission (16,874 ktOE i.e. 99.5%) the only consumption that can be taken into account in the national objectives. Growth in 2018 was even higher than in 2017 (+8.1%), with an additional 1,151 ktOE gain. The distribution of biofuels, in terms of energy content, remains largely to the advantage of the biodiesel sector with a share of 82.0% compared to 17.1% for the bioethanol sector and 0.9% for the biogas fuel sector (Graph 2).

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Tabl. n° 2

Biofuels consumption for transport in the European Union in 2018\* (in ktOE)

Country	Bioethanol	Biodiesel*	Biogas fuel	Total consumption	Of which advanced biofuel***	% compliant**
France	586,0	2 812,0	0,0	3 398,0	21,3	100,0%
Germany***	756,0	1 929,0	34,0	2 719,0	n.a.	99,2%
Spain	160,0	1 568,0	0,0	1 728,0	2,4	100,0%
Sweden	96,6	1 342,6	118,0	1 557,2	n.a.	99,7%
United Kingdom	376,8	897,1	0,4	1 274,3	n.a.	100,0%
Italy	32,6	1 217,0	0,1	1 249,7	65,0	100,0%
Poland	173,0	770,0	0,0	943,0	3,0	100,0%
Netherlands	170,7	330,5	7,2	508,4	n.a.	99,5%
Austria	57,9	423,1	0,3	481,3	1,4	97,1%
Belgium	93,6	381,0	0,0	474,6	5,0	100,0%
Finland	80,7	315,6	0,3	396,7	n.a.	100,0%
Czechia	61,3	247,4	0,0	308,7	0,0	100,0%
Romania	91,1	206,2	0,0	297,2	0,0	100,0%
Denmark	0,0	286,0	0,3	286,3	n.a.	85,2%
Portugal	7,6	272,3	0,0	279,9	0,0	100,0%
Greece	0,0	169,0	0,0	169,0	0,0	100,0%
Bulgaria	26,7	139,6	0,0	166,2	0,0	100,0%
Ireland	27,3	127,0	0,0	154,2	4,1	100,0%
Slovakia	19,6	129,9	0,0	149,5	0,0	100,0%
Hungary	40,0	108,4	0,0	148,4	0,0	100,0%
Luxembourg	10,1	109,5	0,0	119,6	0,0	100,0%
Lithuania	8,0	69,8	0,0	77,8	0,0	100,0%
Slovenia	8,6	34,7	0,0	43,3	0,0	100,0%
Latvia	7,9	1,4	0,0	9,3	0,0	100,0%
Cyprus	0,0	9,0	0,0	9,0	0,0	100,0%
Malta	0,0	9,0	0,0	9,0	0,0	100,0%
Estonia	1,0	0,0	0,0	1,0	0,0	100,0%
Croatia	0,2	0,3	0,0	0,5	0,0	100,0%
<b>Total EU 28</b>	<b>2 892,9</b>	<b>13 905,6</b>	<b>160,6</b>	<b>16 959,1</b>	<b>n.a.</b>	<b>99,5%</b>

\* Estimation. Compliant with Articles 17 and 18 of Directive 2009/28/EC \*\*\*Germany consumption figures include consumption of 1 ktOE of pure vegetable oil.  
 \*\*\*\* Defined as according to art 2 of the RED II. Due to lack of data for several countries, the total has not been calculated. Note: Biofuel consumption data from Finland, Romania, Bulgaria, Hungary, Slovakia, Slovenia, Latvia and Estonia were not available at the time of the survey. For these countries Eurobserv'ER used by default 2017 consumption data. Source: Eurobserv'ER 2019



UPM's Lappeenranta Biorefinery produce wood-based biodiesel - Finland

These estimates are based on the responses to questionnaires sent to the various relevant ministries and statistics offices in charge of renewable energy accounting (sources available at the end of this barometer). However, these figures are provisional because, at the time of our survey, a minority of countries had not yet finalised their biofuel consumption statistics (see note Table 2) or, as in Sweden, were carrying out a complete statistical review of their biofuel consumption data. The data presented will therefore be consolidated in the coming months in the EurObserv'ER annual publication, "The state of renewable energies in Europe". The increase in biofuel consumption is primarily due to an increase in quotas (legal obligations) or incorporation targets (linked to tax incentive) for some countries. Their consumption may exceed the volumes allocated by quotas when the market prices of fossil fuels become higher than those of biofuels. The rise in crude oil prices during 2018, which peaked at \$76 in early October 2018, was on the one hand favourable to biofuel consumption. On the other hand, the physical volumes of incorporation may be limited by the demand for biofuels benefiting from double counting, which is the case notably for biodiesel produced from waste vegetable oils or animal fats.

As in 2017, most of the increase in biofuel consumption came from the biodiesel sector, whether from the traditional fatty acid methyl esters (FAME) or synthetic esters (HVO) obtained by hydrotreating vegetable oils or animal fats. According to EurObserv'ER, the biodiesel consumption dedicated solely to transport in 2018 stood at 13,906 ktoe in the EU28, an increase of 11.6% compared to 2017, equivalent to an additional consumption of 1,450 ktoe. This growth is mainly due to higher incorporation rates in several countries. For example, in Spain, the common rate for bioethanol and biodiesel (in terms of energy content) rose from 5% in 2017 to 6% in 2018, in the United Kingdom the rate, this time in terms of incorporation volumes, rose from 4.75% since 2013 to 7.25% from 14 April 2018, in Poland from 7.1% to 7.5% in Italy from 6.5% to 7% and in the Netherlands from 7.75% to 8.5%. For these last three countries, a common incorporation rate was calculated in terms of energy content.

For its part, the consumption of bioethanol used for transport, whether directly blended with petrol or previously transformed into ETBE (ethyl tertiary butyl ether), has also been increasing since 2017 but at a lower growth rate than that of biodiesel. In 2018, consumption increased by 3.5% to reach 2,893 ktoe (+98.6 ktoe). This increase comes after a long period of stabilization of incorporated volumes caused by legislative adjustments detrimental to bioethanol, including the suspension or recasting of certain incorporation quotas (such as Spain, which in 2016 abolished the specific incorporation quotas for bioethanol), by the advantages of double counting which primarily benefits biodiesel consumption produced from waste oils and by low fossil fuel prices in that period. In countries such as Spain and the Netherlands, this recovery in bioethanol consumption is due to the gradual increase in common incorporation quotas. In Belgium, it is more directly linked to the increase in the specific incorporation mandate for bioethanol from 4 to 8.5% since January 1, 2017 (and will remain unchanged until 2020). In Germany, bioethanol consumption benefited from a lower incorporation of ETBE into petrol, which benefited the incorporation of pure bioethanol.

In France, the sector continued to benefit from the increase in incorporation targets from 7 to 7.5%, effective since 2017, and from the extension of the national network of service stations offering E10 and E85 fuel (see below). The main drawback is the significant drop in British bioethanol consumption in 2018, which has been offset by the very sharp increase in demand for biodiesel benefiting from double counting.

As for the consumption of biogas fuel for Natural Gas Vehicle (NVG) engines, it is now available in 8 countries, with significant volumes in Sweden and Germany. Consumption increased slightly from 158.3 ktoe in 2017 to 160.6 ktoe in 2018. Sweden remains by far the largest consumer of biogas fuel. According to the Statistics Sweden data published in March 2019, biogas fuel consumption (biogas purified to a quality equivalent to that of natural gas) increased from 133 613 000 Nm<sup>3</sup> (standard m<sup>3</sup>) in 2017 (equivalent to 111 ktoe) to 142 038 000 Nm<sup>3</sup> (equivalent to 118 ktoe). At the end of 2018, the country had 185 public service stations delivering biogas (175 in 2017), as well as about 60 non-public stations for local authorities, public transport and corporate fleets. In 2018, the share of biogas in the consumption of gas-powe-

red vehicles was over 91%. According to provisional data from AGEE Stat, German consumption is expected to decrease slightly from 38 ktoe to 34 ktoe, thus limiting growth at EU level.

### FOCUS ON A FEW INDICATIVE COUNTRIES

#### Significant increase in biofuels in the Netherlands

The Netherlands is lagging behind most Member States in the development of renewable energy in its gross final energy consumption. While its target is 14% at the end of 2020, according to Statistics Netherlands, the country only achieved a threshold of 7.4% in 2018 (for an indicative trajectory of 9.9% in 2017-2018). In order to make up for some of this delay, in 2018 the Dutch government decided to significantly increase its consumption of sustainable biofuels. To this end, it has planned to almost double the mandate of incorporation in two years, which, in terms of energy content, will increase from 8.5% in 2018 to 12.5% in 2019, then increase to 16.4% in 2020, including double counting. An additional target has been added for advanced biofuels, the minimum share of which will simultaneously increase by 0.6%, 0.8% and 1%. The

level of incorporation of biofuels produced from food crops will be capped at 3% in 2018, 4% in 2019 and 5% in 2020. According to Statistics Netherlands, total consumption of biofuel and biogas for transport has already increased significantly between 2017 and 2018 (+63.1%) up from 311.5 ktoe to 508.4 ktoe. This growth is directly related to the incorporation requirement, which rose from 7.75% in 2017 to 8.5% in 2018. Virtually all consumption (99.5% in 2018) has been certified as sustainable, and therefore eligible for European targets. The increase in biodiesel consumption (+86.5%, from 177.2 to 330.5 ktoe) was greater than the increase in bioethanol consumption (+32.4%, from 129 ktoe to 170.7 ktoe) and the increase in biogas fuel (+33.6%, from 5.4 to 7.2 ktoe).

#### The United Kingdom changing aspirations

The new RTFO (Renewable Transport Fuel Obligation) legislation came into force on April 15, 2018, with the aim of significantly and rapidly increasing the use of sustainable biofuels. The mandatory volume of sustainable fuel incorporation (the target was calculated by volume and not energy content), which is common to all sectors, has therefore increased from 4.75% to 7.25% of

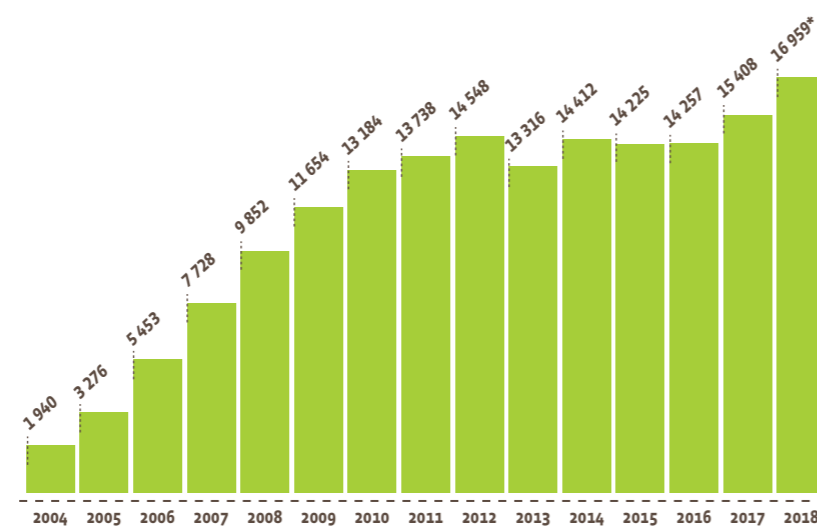
total fuel consumption as of April 15, 2018 and will remain so until December 31, 2018. The volume of incorporation, which is then calculated on a traditional calendar year, increased to 8.5% in 2019, then will rise to 9.75% in 2020 and will gradually increase until 2032 to reach the 12.4% rate. This should double the use of sustainable fuels by 2020.

From January 1, 2019, an additional target has been added in relation to the Development Fuel Target. Developing fuels are defined as being produced from sustainable waste and residues (with the exception of separated oils and fats such as cooking oils and tallow) and also include renewable fuels of non-biological origin (RFNBO). They can also be used as hydrogen, renewable methane (produced by pyrolysis and gasification), aviation fuel. The aim of the new scheme is therefore to promote the development of renewable fuels for aviation and renewable non-biological fuels. The "Development Fuel" target will start from 0.1% in 2019 to 2.8% in 2032. It should be noted that the actual volumes will be halved, as these specific fuels are subject to double counting. The United Kingdom has also capped the maximum amount of renewable transport fuel that can be obtained from food crops. It will represent a maximum incorporation volume of 4% between 2018 and 2020, then from 2021 onwards it will gradually decrease to 3% in 2026, reaching 2% in 2032.

In 2018, the change in legislation fully benefited the biodiesel sector, and more particularly production benefiting from double counting (notably waste oils, food waste and animal fats). According to the Department for Business, Energy and Industrial Strategy (DBEIS), biodiesel consumption jumped by 51.8% from 590.9 ktoe in 2017 to 897.1 ktoe in 2018. Meanwhile, bioethanol consumption decreased from 403.4 ktoe to 376.8 ktoe, mainly due to a decrease in gasoline consumption in the country. Another interesting point is that all British consumption in 2017 and 2018 was certified as sustainable by the RTFO (Renewable Transport Fuel Certificates) certification system. Over

### Graph. n° 1

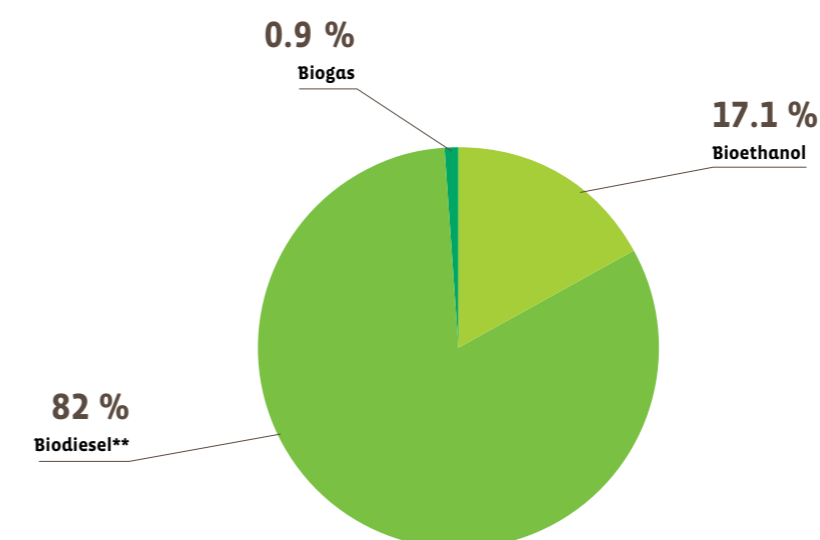
European Union (EU-28) biofuel (liquid and biogas) consumption trends for transport (in ktoe)



\* Estimation. Sources : Data for compliant and non compliant biofuel from 2004 to 2016 (Shares 2019), data for 2017 to 2018 (EurObserv'ER 2019).

### Graph. n° 2

Breakdown of total EU 2018\* biofuel consumption for transport in energetic content by biofuel type



\* Estimation. \*\* Biodiesel data include biofuel from pure vegetable oil. Source: EurObserv'ER 2019.

the period from 15 April to 31 December 2018, of the 2 543 million certificates granted, 2 076 million were derived from fuels produced from waste, residues or raw materials benefiting from double counting and 68 % of the certificates were obtained from fuels benefiting from double counting.

### Advantages of E85 in France

In 2018, France was the number one consumer of biofuel in Europe. According to the Renewable Energy Division of the Data and Statistical Studies Department (SDES), biofuel consumption for transport increased from 3,335 ktoe in 2017 to 3,398 ktoe in 2018, i.e. an increase of 1.9%. This growth was mainly driven by bioethanol consumption (+8.7% between 2017 and 2018), which increased by 47 ktoe (total of 586 ktoe in 2018) and to a lesser extent biodiesel consumption (+0.6% between 2017 and 2018), which increased by only 16 ktoe (total of 2,812 ktoe in 2018). The consumption of advanced biofuels as defined by RED II decreased very slightly between 2017 and 2018, from 22.5 ktoe in 2017 to 21.3 ktoe in 2018. The low growth in French total biofuel consumption is explained by identical incorporation targets (in terms of energy content) between 2017 and 2018, namely an energy share of 7.5% for petrol and 7.7% for diesel. In 2019, the incorporation targets will be increased to 7.9% for both the petrol and diesel sectors. The slightly more significant growth in bioethanol consumption can be explained by the extension of the national network of service stations

offering E10 and E85 fuel (895 stations offering E85 in France), the increasing number of registrations of so-called flex-fuel vehicles and the legalization of E-85 fuel conversion kits for gasoline vehicles. This enthusiasm for E85 is explained by a particularly attractive pump price of around €0.7 per litre.

In addition, the Energy Transition Law for Green Growth provides that priority should now be given to the development of advanced biofuels while preserving investments in conventional biofuel production chains. The objectives for incorporating advanced biofuels into fuels are defined in the Multi-Year Energy Plan. They are set at 1.8% in 2023 and 3.8% in 2028 for the petrol sector and 0.85% in 2023 and 3.2% in 2028 for the diesel sector.

### A HIGHLY COMMITTED EUROPEAN INDUSTRY

According to Eurostat, the European bioethanol industrial sector produced 3.53 million tonnes of ethanol in 2017, although its production capacity is estimated at 7.07 million tonnes. These volumes are mainly used for transport purposes (81%), but also the industry (10%) and food sector (9%). The official figures for 2018 have not yet been published, but the USDA Foreign Agricultural Service<sup>(2)</sup> annual study estimates that the volumes of bioethanol produced in 2018 in the EU have increased very slightly (+1.17%), which would lead to a figure of 3.57 million tonnes. The sector has continued to recover since 2016, when bioethanol

production volumes reached 3.29 million tonnes. This recovery was mainly supported by the increase in domestic consumption of petrol-type fuels, which increased in value compared to diesel. However, the drought in 2018 led to price increases for maize and wheat, which deteriorated industrial margins and was a limiting factor in the sector's development.

Three countries share more than 50% of the bioethanol production for the entire European Union: Germany, France and the United Kingdom. Germany is the European leader with a production of 640,000 tonnes in 2017, but it is estimated that its production volumes will fall by 9% in 2018. The German Bioethanol Manufacturers Association attributes this decline to drought, which led to a substantial increase in raw material costs. A slight recovery in production is expected in 2019. France is the second largest European producer, notably through its companies Tereos and Cristal Union (see table 3), producing 640,000 tonnes in 2017 and is expected to maintain the same level in 2018. The same stability

2) The United States Department of Agriculture conducts an annual study which notably estimates biofuel production levels in the European Union countries for 2018. However, since USDA's work is not based on Eurostat data for years prior to 2018, a methodological choice was made to not directly reproduce their production estimates for 2018 but to apply the USDA study's evolution rates to Eurostat 2017 figures.

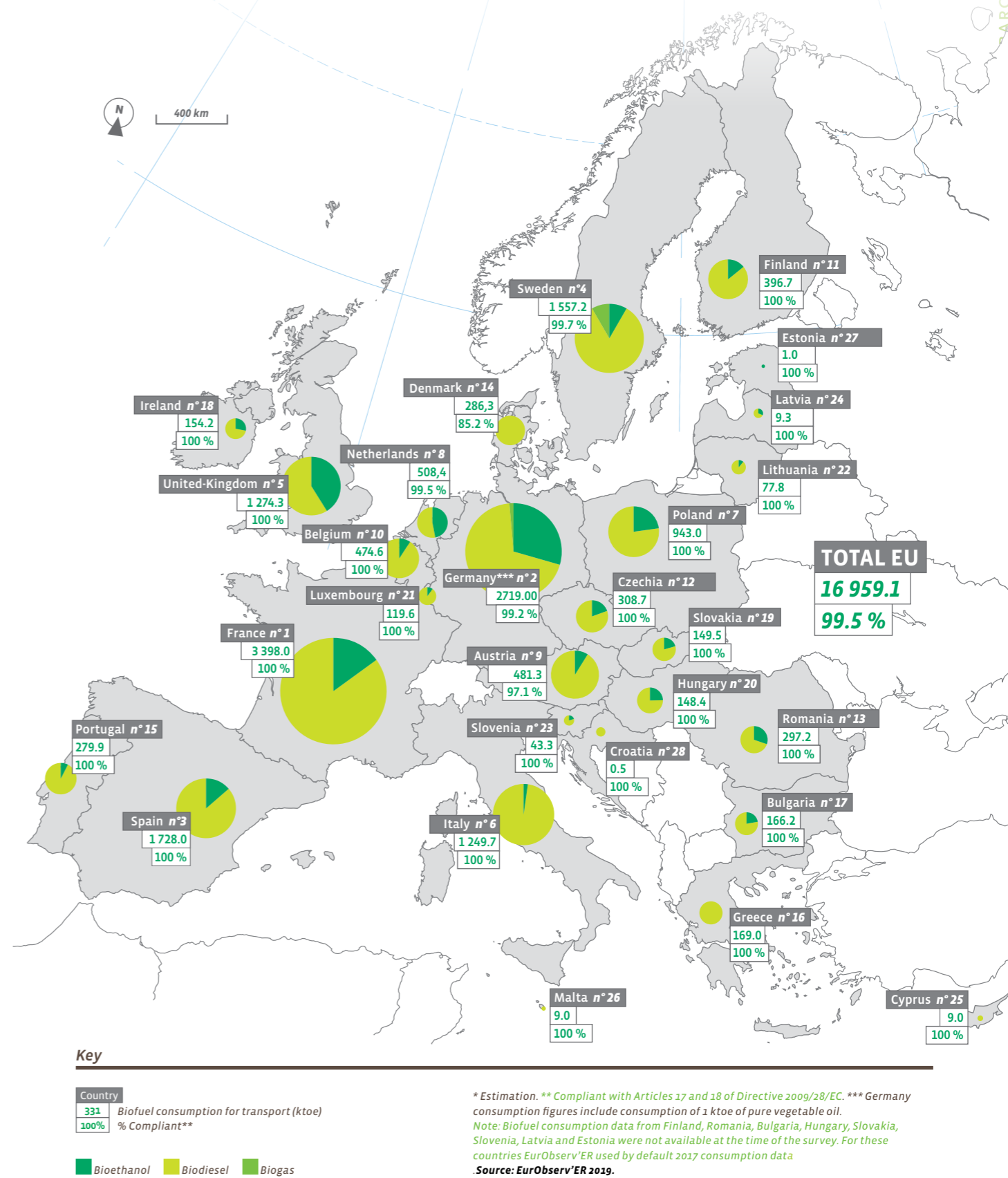
Tabl. n° 3

Production of the main European bioethanol producers in Europe in 2018 (in million of litres)

Company	Country	Location of plants in Europe	Bioethanol production (in million of litres)	Raw materials
Tereos	France	France, Czechia, UK, Italy	1 200	Sugar juice, wheat
Crop Energies	Germany	Germany, Belgium, France, UK	967	Sugar juice, wheat, maize, triticale
Vivergo	United Kingdom	UK	420	Wheat
Cristal Union	France	France	320	Sugar juice, wheat
Agrana	Austria	Austria	250	Wheat, maize

Source: EurObserv'ER 2019.

Biofuels consumption for transport in the European Union in 2018\* (in ktoe)





**Total group HVO production  
Pretreatment unit - La  
Mède, France**

group has announced investments that could enable them to reach the 3 million tonnes per year threshold in 2020.

#### HVO gains a share of the market

The industrial dynamics of the biofuels sector is now partly driven by the HVO biodiesel sector, an innovation that has enabled the oil industry to regain some of the market share lost by fossil fuels to biofuels. New industrial sites are expected by 2021 in France and Italy, which should enable volumes of around 4.5 billion litres, compared to European production estimated by the USDA Foreign Agricultural Service at 2.8 billion litres in 2018. The Finnish company Neste is a pioneer in the sector, as it is responsible for the development of HVO-type biodiesel. Today the group has two sites of 215 million litres each in Finland and a unit in Rotterdam with a capacity of 1,280 million litres, making it the leading European producer of HVO. In Italy, the Eni group, which has been operating a site in Venice since 2014 (325 million litres of annual capacity), has been involved since 2016 in the conversion of a refinery in Sicily into a unit capable of producing second generation HVO. Commissioning is expected in the second half of 2019 with a production capacity of 960 million litres, making it the second largest production site in Europe after the Neste unit in the Netherlands. The Total oil group has also positioned itself in the HVO sector with the brand new bio-refinery production unit at La Mède (located in the Bouche du Rhône, France). Initially planned for 2018, it was not commissioned until July 2019. The site will source up to 60 to 70% of its supply from raw vegetable oils (rape-seed, palm, sunflower) and 30 to 40% from waste reprocessing (animal fats, cooking oils, residual oils). The biofuels produced from oils and fats can be counted twice in the energy balance of the country that will consume them, in accordance with the European directive for the development of this type of fuel. This plant has a maximum capacity of 640 million litres per year. The supply of palm oil is closely monitored by environmental NGOs. Even if Total has reaffirmed its commitment to limit its supply of raw palm oil to less than 50% of raw material volumes and to

**Tabl. n° 4**

*Production capacity of the main biodiesel producers in 2018 (in tons)*

Company	Country	Location of plants in Europe	Biodiesel production capacity (in tons)
Neste	Finland	Finland, Netherlands	2 700 000
Avril	France	France, Germany, Italy, Austria, Belgium	1 552 000*
Infinita	Spain	Spain	600 000
Verbio AG	Germany	Germany	470 000
Total Group	France	France	470 000
Eni	Italy	Italy	219 000*
Marseglia Group (Ital Bi Oil)	Italy	Italy	200 000

\*Production and not capacity, which may be higher. Source : EurObserv'ER 2019.

can be observed for the United Kingdom, which should have produced volumes in 2018 that are significantly close to the 511,000 tonnes announced by Eurostat for 2017. While the sector has benefited from the increase in the blending mandate in the new UK legislation, the simultaneous and gradual reduction in the ceiling for biofuels based on agricultural crops has pushed farmers to shift more towards biodiesel. For the biodiesel sector, a distinction should be made between the FAME (fatty acid methyl ester) sector, where producers come from the agricultural sector, and the HVO sector (derived from hydrogenated vegetable oil), which comes from the oil and refinery sectors. The latter is the most recent and is currently being developed industrially in six European countries, while FAME production units are present in almost all member countries. In 2017, Eurostat figures show a

production of 13.71 million tonnes for both sectors and a much higher production capacity of 21.96 million tonnes. However, the USDA Foreign Agricultural Service study estimates that production would have contracted by 6.1% in 2018, corresponding to volumes of around 12.87 million tonnes. This decrease was observed despite an increase in biodiesel consumption in 2018 in the European Union countries. This decrease is mainly due to intense competition from FAME imports from Argentina (mainly soybean oil methyl ester, SME) and Indonesia (palm oil methyl ester, PME). The main producing countries are Germany, France, the Netherlands and Spain, which accounted for 68% of total EU production in 2017. On the industrial side, the Finnish company Neste, which has production units in its home country and the Netherlands, is one of the most significant (see table 4). The

use only oils that meet the sustainability criteria set by the European Commission, NGOs insist on the role of palm oil production in the deforestation of the southern countries. An appeal, still pending in September 2019, was filed in July 2018 with the Marseille Administrative Court against the prefectural authorization of the site. Another project is BioTFuel, a cooperation between Avril, Axens, CEA, IFPEN, ThyssenKrupp and the Total group. This unit aims to produce 230 million litres of advanced biodiesel per year from one million tonnes of biomass by 2020. The demonstration plant is located in Total's former Flanders refinery in Dunkirk. In relation to the advanced biofuel technologies, as defined by RED II, although the production volumes are not yet substantial, first units are already operational and others are under construction. For example, UPM's Finnish biorefinery Lappeenranta, commissioned in January 2015, is the first of commercial size plant (100.000 tonnes per year) to produce biodiesel based on wood from forest residues (see photo). Another example, the Dutch group BioMCN with a unit that

produced 75 million litres of biomethanol from biogas in 2018. In addition, a consortium comprising Enerkem, Shell, Air Liquide, Nouryon and the Port of Rotterdam plans to build a municipal solid waste and biomethanol treatment plant in Rotterdam. The facility is expected to convert 360,000 tonnes of non-recyclable waste into 270 million litres of biomethanol. A final investment decision will be taken in 2019. In Finland, a cellulosic ethanol plant with an annual capacity of 10 million litres was commissioned in 2018. It is planned to expand production to around 50 million litres. The raw material is sawdust. This project, called Cellunolix, is managed by St1 Biofuels Oy in cooperation with North European Bio Tech Oy. Another plant with a capacity of 50 million litres is expected to be operational in 2020. Further biorefinery projects are announced for the conversion of woody biomass into cellulosic ethanol. Further biorefinery projects are announced for the conversion of woody biomass to cellulosic ethanol. Projects are planned for units in Slovakia and Romania with a capacity of about 65 mil-

lion litres each from cereal straw. The production of these sites is announced for 2020. These technologies are therefore paving the way for their ramp-up in the coming years, since the European directive has set their share in fuel consumption at 3.5% by 2030.

### FINAL RUSH BEFORE 2020

Consumption of certified sustainable biofuels, whether from food crops, waste or by-products, is expected to increase significantly across the EU over the next two years. These increases will be in line with the increase in national mandates of incorporation and other specific obligations on distributors (e.g. in Germany and Sweden, to reduce greenhouse gas emissions from road fuels).

For example, between 2018 and 2020, requirements for the incorporation of sustainable fuels in energy content will increase from 7 to 9% in Italy, from 6 to 8.5% in Spain, from 7.5% to 8.5% in Poland, from 8 to 16.4% in the Netherlands, from 5.75% to 8.75% in Austria, from 15 to 20% in Finland and from 7.5% to 10% in Por-

tugal. Even if double counting limits the volumes actually incorporated, the Member States will have to undertake a final sprint to achieve their 2020 objectives. For some countries, biofuel imports will constitute a convenient adjustment variable to meet their objectives, whether in the transport sector level or at a more global level. According to EurObserv'ER, at the end of 2020, the biofuel consumption level in terms of energy content could exceed 20 Mtoe and even reach 21 Mtoe, the United Kingdom included. In the longer term, by 2030, the authors of the USDA's EU Biofuels Annual 2019 report have engaged in prospective work. Taking into account historical EU fuel consumption records and the European Commission's projections for fuel use in transport (from its EU publication Reference Scenario 2016 Energy, transport and GHG emissions Trends to 2050) and combining them with the 7% cap, the maximum potential consumption of biofuels from food crops could theoretically reach 23 Mtoe in 2022 and then increase to 21 Mtoe in 2030. This decrease is due to the fact that advanced biofuels or biofu-

els produced from oils or fats would take precedence over fuels from food crops. These consumption levels are theoretical and will evolve according to the policy of the various Member States to give less importance to the least sustainable "agrofuels" or those with a significant ILUC effect. For example, the United Kingdom has already planned to gradually reduce its agrofuel consumption. This implies giving greater significance to advanced biofuels benefiting from double counting and other energy sources to achieve the mandatory 14% share. The contribution of non-advanced biofuels benefiting from double counting (used vegetable oils and separated fats), which are very economical, should be pursued as a matter of course. However, given the maximum share of 1.7% allocated to them, their volumes should be capped at 5 Mtoe. The contribution of advanced biofuels, whose minimum share has been set at 3.5%, is expected to reach a minimum of 10 Mtoe by 2030. The theoretical maximum production of biofuels as a whole could therefore reach 36 Mtoe by 2030, or more than twice the consumption measured in

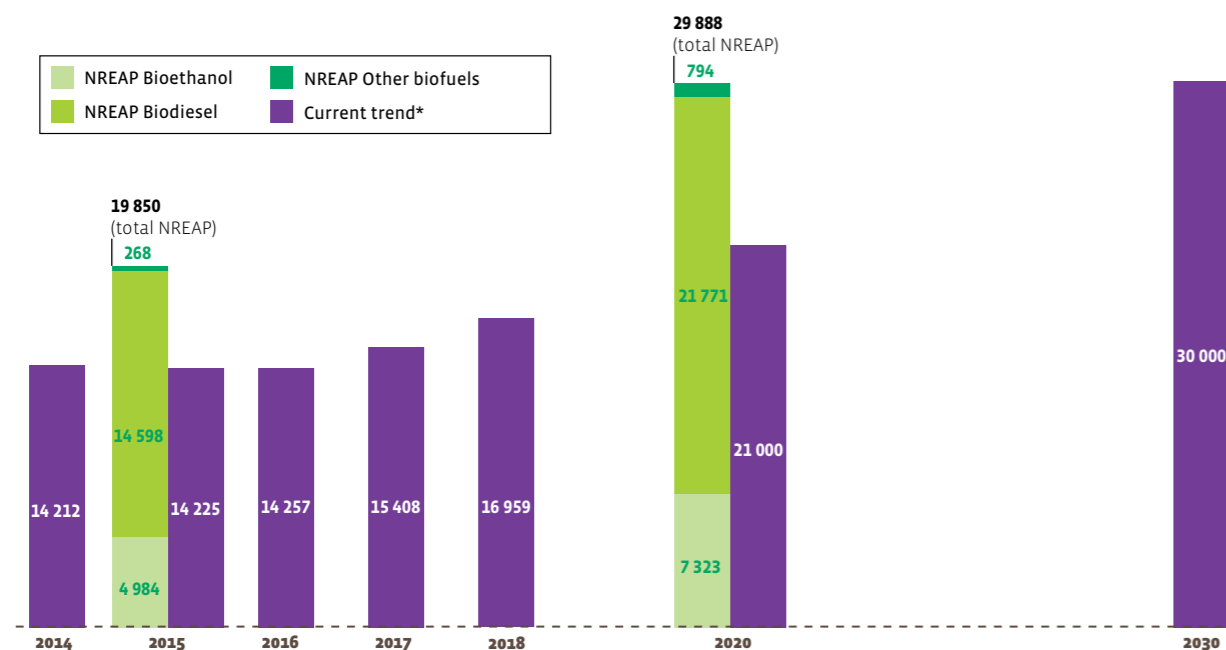
2018. EurObserv'ER projections estimate that the consumption of biofuels used for transport will be in the region of 30 Mtoe in 2030 (the UK included), due to a lower interest in agrofuels with a high ILUC effect and the increasing importance of electric mobility (see graph n°3). □

Sources used: AGEE-Stat (Germany), ENS (Denmark), GSE (Italy), Ministry of Energy (Poland), Ministry of Environment and Energy (Greece), Ministry of Industry and Trade (Czech Republic), SDES (France), Statistics Netherlands, DGEG (Portugal), SEAI (Ireland Rep.), Statistics Austria, DBEIS (United Kingdom), IDAE (Spain), Ministry of Energy (Cyprus), Statistics Lithuania, NSO (Malta), SCB (Sweden), SPF Economie (Belgium) STATEC (Luxembourg), EurObserv'ER

The next barometer will cover ocean energy

## Graph. n°3

Comparison of the current biofuel consumption for transport trend against the NREAP (National Renewable Energy Action Plan) roadmaps (ktoe)



\* Biofuel consumption sustainable compliant and not compliant. Source: EurObserv'ER 2019.



This barometer was prepared by Observ'ER in the scope of the EurObserv'ER project, which groups together Observ'ER (FR), ECN part of TNO (NL), RENAC (DE), Frankfurt School of Finance and Management (DE), Fraunhofer ISI (DE) and Statistics Netherlands (NL). This document has been prepared for the European Commission however it reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.