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Vegetal fuel and recycled oil: are biofuels really sustainable?

Biofuels are one of the pieces in the European Union energy transition strategy, but they still pollute at a local level and may even worsen emissions. We analyse publicity messages, as well as the narratives reaching social media and political debate

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1. Executive Summary

The European Union has set the goal of achieving carbon neutrality by 2050. Decarbonising road transport is one of the key tools in this roadmap, because cars and vans are responsible for 15% of all CO_2 emissions in the EU. To do so, a regulation approved in 2023 will allow only for 'zero-emisson' new cars and vans to be sold in the EU from 2035 onwards. The approval was highly disputed, and the regulation is still debated today, with some countries like Italy, Poland and the Czech Republic recently asking for a relaxation of the measures. The automotion industry and political parties like the EPP also ask for a softer version. One of the key petitions is making an exception for biofuels, that is, allowing their use in new cars and vans after 2035. But can biofuels be considered zero-emissions? Where does this idea come from?

Verificat analysed the communication strategies of the three biggest oil companies with roots in the EU (Shell, TotalEnergies and Eni), as well as the two largest in Spain (Repsol and Moeve), in order to gain knowledge on how they communicate on biofuels. We found no explicit disinformation in their communications, as they tend to use a vague and unspecific language that makes fact-checking difficult. Yet, their websites show a mainly optimistic approach that dwarfs or even omits the challenges and controversies biofuels face. We summarized the communication efforts in four main narratives also shared by sector lobbies such as Tour d'Europe and *Plataforma para los Combustibles Renovables* (in Spain).

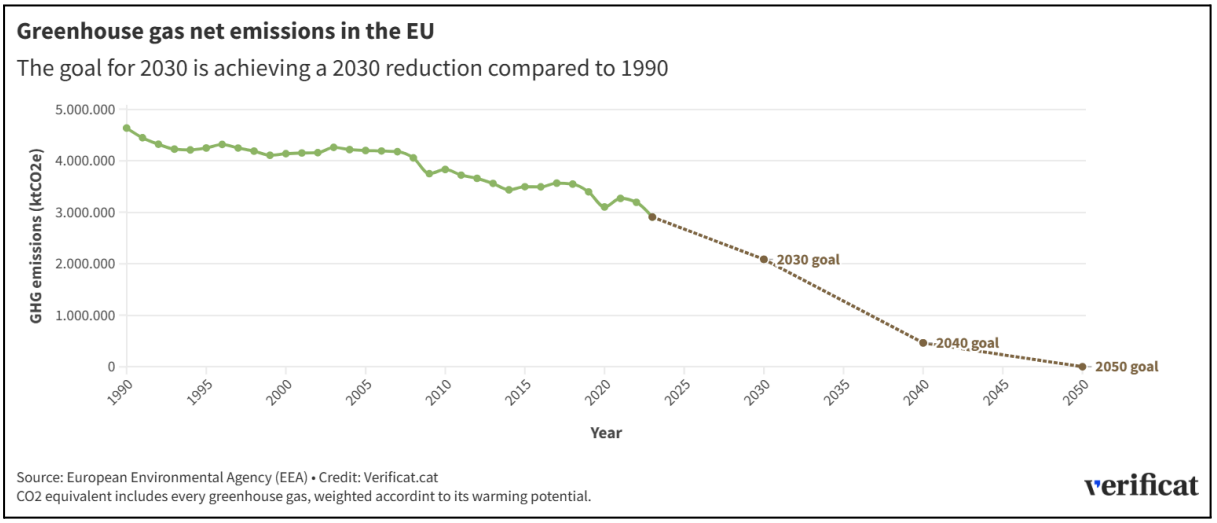
This oversimplification of a complex reality finds its way into social media. An analysis of 170 Spanish posts in X (formerly Twitter) including the word “biofuel” shows the same four narratives being adopted by many accounts, albeit with an aggravation: some of them idealise biofuels to the point of considering them an effective and realistic alternative to electrification. This content is often presented with explicit disinformation attacking EVs, mainly through the narratives "they catch fire more easily than traditional vehicles", or "they pollute more". Technooptimistic messages were also identified. On the other hand, some X users attack biofuels under the idea they are always made of agricultural feedstocks, a falsehood reflecting wide misinformation on the subject and polarization.

Biofuels are a developing field experts believe will play a role in reducing emissions of sectors like shipping, aviation and heavy road transport. Yet their benefits —and the precision of common adjectives like 'renewable' or 'sustainable'— largely depend on the scale in which they are used. Poorly managed, they may even increase emissions and promote deforestation. Our report is a deep dive in the biofuel industry, first including a factual analysis of their potential and limitations, and then thoroughly reviewing and contextualizing the industries' language and narratives, as well as how they intertwine with political discourse and social perception.

2. Introduction

The European Union has set the goal of achieving carbon neutrality by 2050, which involves reducing greenhouse gas emissions and offsetting those that cannot be eliminated. This is one of the main strategies for combating climate change and is part of the idea, promoted by the European Green Deal, that economic growth does not have to be synonymous with increased pollution.

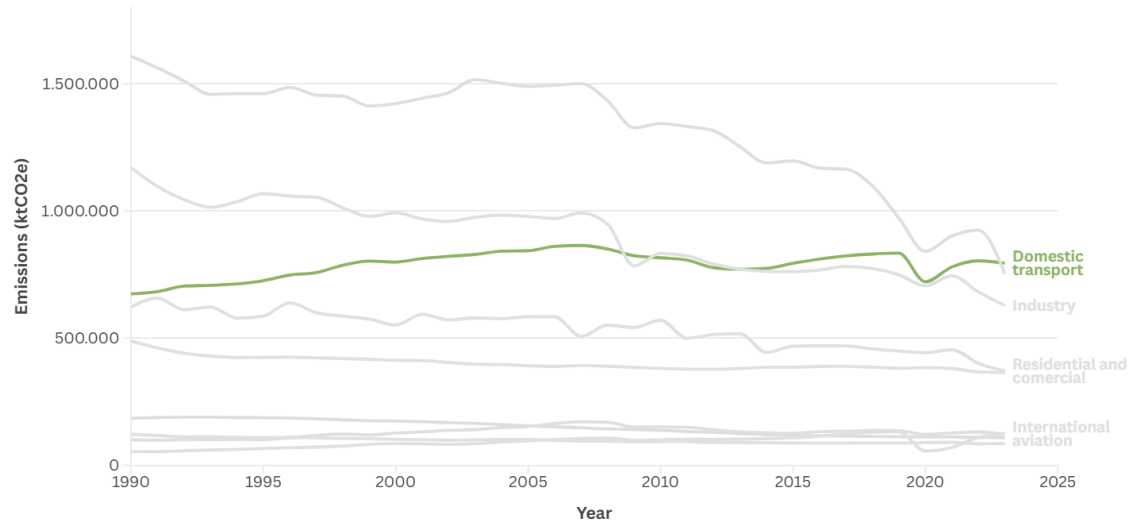
On its road towards neutrality, the EU aims to reduce its emissions by 55% by 2030, and a 90% by 2040, compared to 1990 levels. By 2023, net emissions had fallen by 37%.



The transport sector is one of the main goals in order to guarantee the track's feasibility, as it is the only one with increased emissions since 1990, according to data from the European Environment Agency (EEA).

Greenhouse gas emissions in the EU

By sectors, 1990-2023



Source: European Environment Agency • Credit: Verificat.cat

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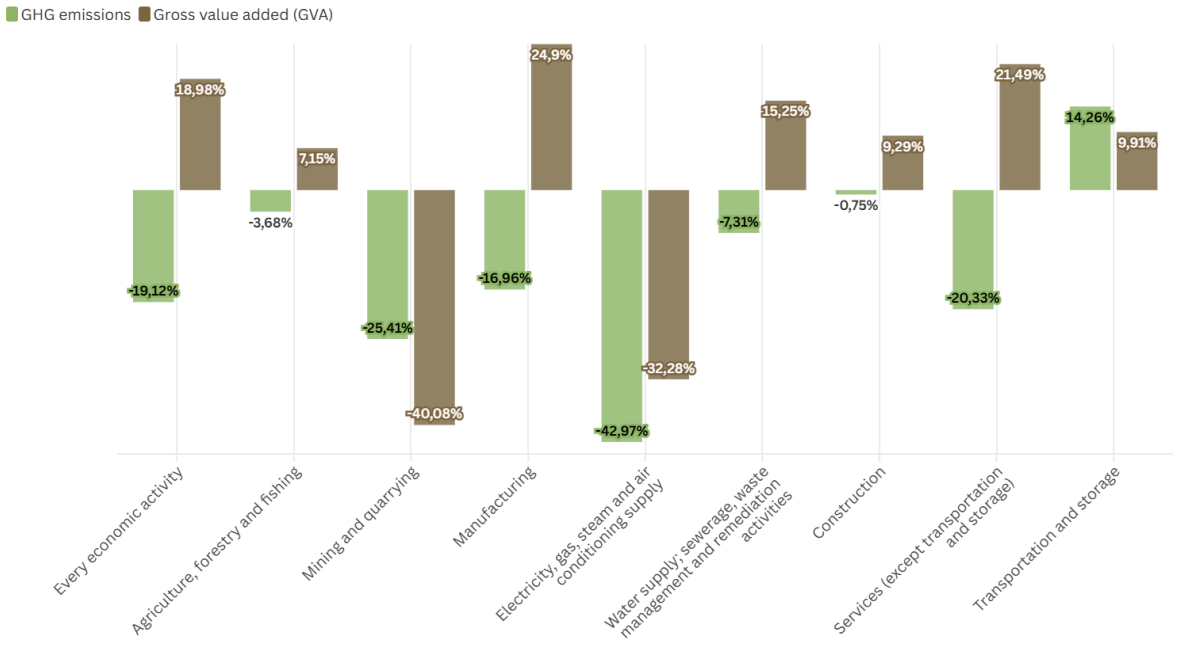
Transportation and storage are the only economic activities with rising emissions

Gross value added (GVA) has risen for every economic activity in the EU in the last ten years, even though their mean emissions fell by 19%



Source: Eurostat • Credit: Verificat.cat

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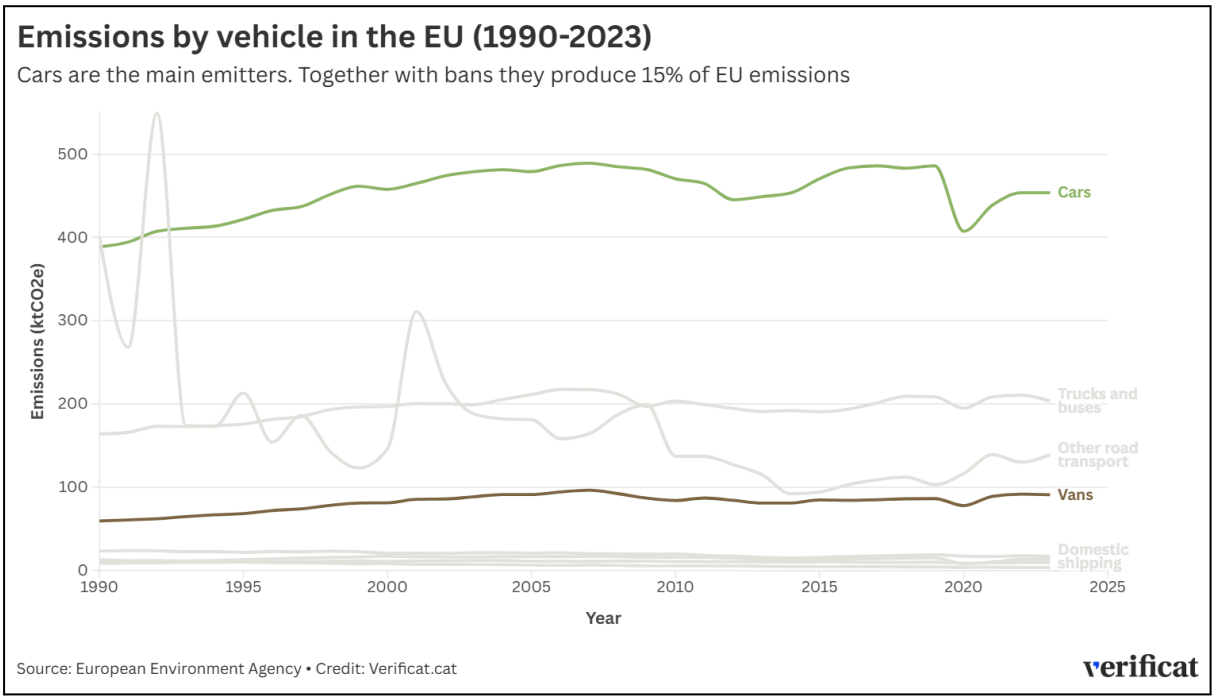
More precisely, European authorities have pointed towards road transport as a key challenge in their roadmap, because cars and vans are responsible for 15% of all CO_2 emissions in the EU, according to data from the European Parliament.



To achieve the emission reduction, in 2021 the EU proposed a package of climate measures called Fit for 55, which set specific targets for each sector and, in terms of transport, represented a clear commitment to electric vehicles, as pointed out by the President of the European Commission, Ursula Von der Leyen in statements to the press last March. Her appearance closed the second meeting of the 'Strategic Dialogue', a meeting point between the Commission and the main players in the automotive industry. A new meeting will be held on Friday 12 September within this framework.

The specific measure targeting road transportation, which has been particularly controversial among the automotive industry and some political parties and Member States, stipulates that from 2035 onwards, only new cars and vans that are 'zero emissions' will be allowed on the market. In other words, in ten years' time, new cars and vans that run on petrol or diesel will no longer be able to be registered in the EU. The regulation states that the average lifespan of these vehicles in the Eurozone is 15 years. It therefore aims to achieve a fully carbon-neutral fleet by 2050.

In an attempt to make the 2035 target more flexible, which some involved countries and the automotive industry see as difficult to achieve, biofuels have entered the debate. Biofuels are a type of fuel that comes from organic matter and is sold under the promise to be more sustainable than oil. They can run on traditional internal combustion engines while, theoretically, reducing emissions, which is why some countries are still calling for them to be included as an exception.

So far, the ban has not taken these appeals into account, although there are European regulations promoting their use and production, especially in maritime and air transport, but also in road transport. This framework, which encourages large companies in the oil sector to include biofuels in their offerings, has led to wide communication, advertising and also misinformation surrounding this type of fuel. The appeals are supported by countries such as Italy and parties such as the European People's Party (EPP), which defend their 'sustainability' in order to include them as an exception to the ban.

A controversial measure

The road to approval of the ban by 2035 has been winding. Back in 2022, when the regulation was still under negotiation, Jens Gieseke, MEP and negotiator for the European People's Party Group, warned in a statement that it could cause a 'Havana effect', filling European streets with 'vintage cars, because new ones will not be available or affordable'. In the statement, he called for biofuels to be included in the EU's green future: 'A voluntary regulation for climate-neutral biofuels and synthetic fuels would have been better in order to preserve technological openness and a certain flexibility for the producers'.

The debate over flexibility reached its peak when the regulation was approved in 2023. At the last minute, Germany secured the addition of an exception for e-fuels, which will allow vehicles running on these synthetic products to be marketed beyond 2035. These fuels are considered carbon-neutral, but are not yet produced on a large scale and are expensive. Biofuels, although negotiated until the end, were left out of the agreement.

Even with the ban approved, the regulation continues to face difficulties. Ursula von der Leyen met with key players in the automotive industry in early 2025 for a 'Strategic Dialogue'. The session resulted in a statement from the President of the European Parliament acknowledging that there is 'a clear demand for more flexibility in relation to CO_2 targets' in the sector. The Commission claimed to have 'taken note' of this and committed to 'addressing this issue in a balanced and equitable manner'. A few months later, in May 2025, the 27 Member States revised the regulation and approved an amendment offering more flexibility to vehicle manufacturers in achieving an interim target of emissions reduction between 2025 and 2027.

What are biofuels?

Biofuels are products derived directly or indirectly from organic matter of biological origin, also known as biomass. Wood, corn and algae, for example, make up this matter, which, in order to grow, usually absorbs carbon throughout its life cycle through photosynthesis. International organisations such as the United Nations consider biomass to be a common source of renewable energy because it can be produced continuously and is abundant, as opposed to 'fossil fuels such as coal, oil and gas', which are not renewable energy sources because 'they take hundreds of millions of years to form'. This is the argument used by European institutions, international agencies and large oil companies to establish that biofuels are therefore also renewable.

However, this condition is only met if the natural regeneration rates of raw materials are respected in the production of biofuels and if demand does not exceed stocks, explains environmental scientist and science communicator Andreu Escrivà to Verificat. Massive extraction could deplete these natural sources, thus moving away from renewables. Furthermore, as the UN itself warns, 'bioenergy should only be used in limited applications, given potential negative environmental impacts related to large-scale increases in forest and bioenergy plantations, and resulting deforestation and land-use change'.

On the other hand, these same institutions, agencies and companies include these products as key elements in the path towards net-zero emissions. The argument is based

on the fact that when they are burned to produce energy, they release the same carbon that they had previously captured, creating, in theory, a balance between absorption and emission.

However, it should be noted that biofuels not only emit greenhouse gases when burned, but also that the production of raw materials, their conversion into fuel, and their transport and distribution (especially if imported) also have a carbon footprint. In other words, when the entire life cycle of these products is taken into account, their net emissions are not zero.

Taking this entire process into account, Jordi Guilera, a researcher at the Catalonia Institute for Energy Research (IREC) and professor at the University of Barcelona (UB), explains to Verificat that 'biofuels can reduce emissions by up to 80-85%'. However, depending on the origin of the raw material, emissions can skyrocket, according to the UN. This is particularly true for what are known as first-generation biofuels, which are obtained from cultivable and edible raw materials and are generating widespread controversy.

A large proportion of the biofuels produced worldwide, especially in Latin America and the United States, fall under this definition because they are produced from cultivated products such as corn, soybeans, palm oil, and sugar cane. If agricultural land is used for this type of biofuel, it reduces the amount of land available for growing food for people or animals, which has a direct impact on food prices, according to the Food and Agriculture Organisation (FAO). In some cases, forests are even cleared or deforested, as the scientific community has reported in the case of the Amazon in Brazil.

These situations fall under the concept known as indirect land use change (ILUC), which contributes to climate change because it reduces carbon sinks, which are natural areas like forests that absorb this type of greenhouse gas and store the carbon it contains.

That is why the European Union is in the process of no longer considering first-generation biofuels as a decarbonisation alternative. Although a quarter of those consumed in Spain in the transport sector still come from crops, according to a report by Ecodes, the Ecology and Development Foundation, a non-profit environmental organisation.

The importance of origin in biofuels is such that it constitutes a way of classifying them into four categories, from first to fourth generation: those derived from edible crops, waste, aquatic biomass (such as algae), and synthetic fuels, in that order. However, some experts and sources do not consider the latter to be biofuels, as they are not purely biological in origin, but synthetic.

Biofuel type	Origin	Pros	Cons	Comments
First generation	Edible crops (maize, sugar cane, soybeans or palm oil)	Widely used in Brazil and the United States.	Cropland and food used for energy production, deforestation, biodiversity loss, indirect land-use change.	The EU limits the amount of first generation biofuels countries can count as renewable energy. It will be zero by 2030. These biofuels will not be considered renewable.
Second generation	Waste (municipal, crop, wood scraps, used oil)	They do not pose the food or fuel dilemma.	Complex and therefore expensive production.	It is unlikely for the EU to produce enough waste as to provide enough second generation biofuel for its whole vehicle fleet.
Third generation	Algae and cyanobacteria	They do not pose the food or fuel dilemma. They have a short crop cycle.	Its economic availability and scalability is unclear.	They are on a developmental phase and are not an immediate alternative.
Fourth generation	Genetically modified microorganisms	They do not pose the food or fuel dilemma. They include carbon capture and storage in their production cycle.	Its economic availability and scalability is unclear.	They are on a developmental phase and are not an immediate alternative. Some experts do not consider them biofuels because of their synthetic origin.

Sources: Britannica, European Comission, USDA • Credit: Verificat.cat
Jordi Guilera, IREC and UB researcher did contribute in this table conceptualisation.

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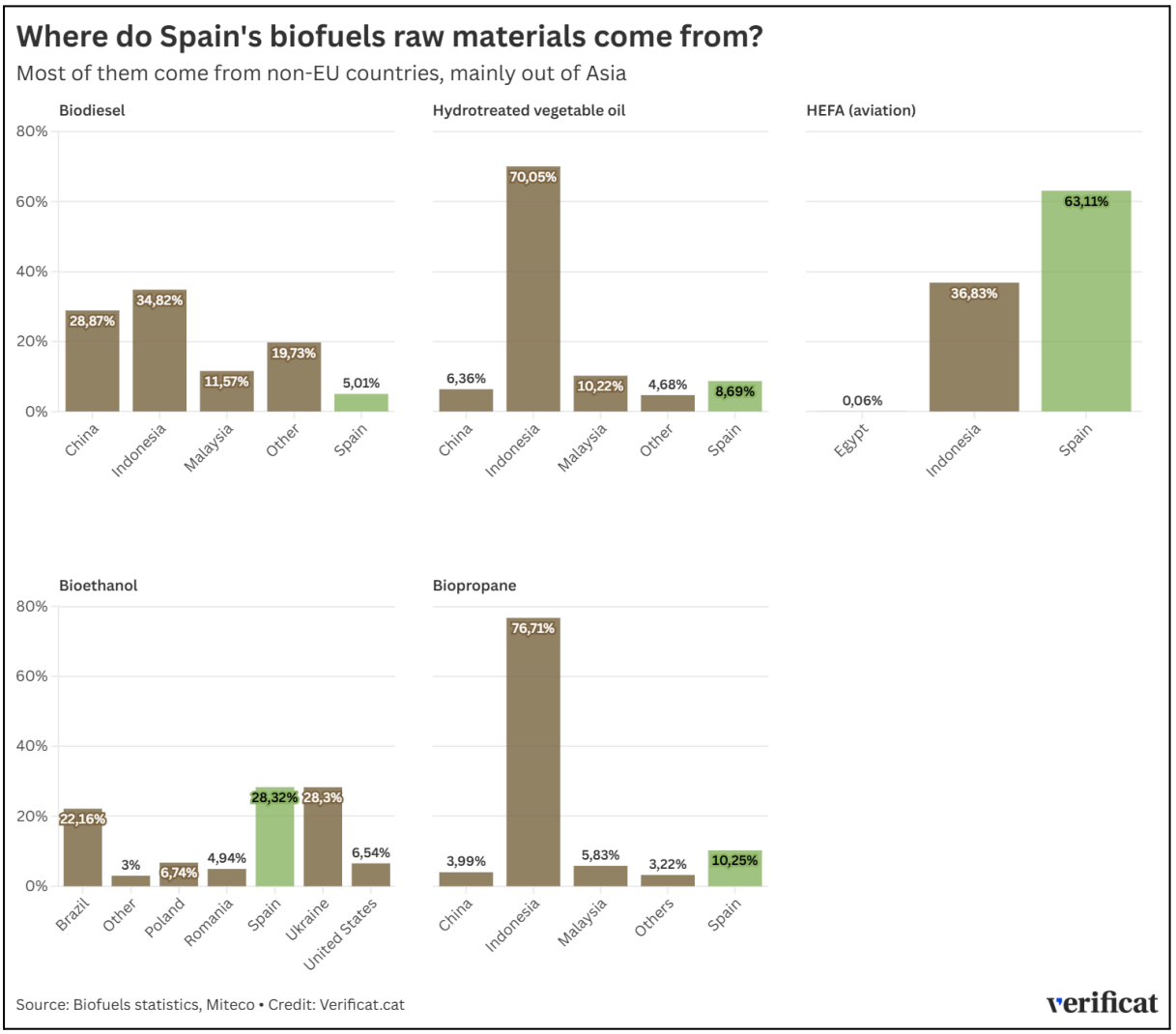
For now, the EU is committed to second-generation biofuels, which use waste materials such as plant debris and used oil as raw materials. This promotes a more efficient use of resources, and the industry fits them into the circular economy, although this depends on how they are managed. At the moment, they are more expensive to produce than first-generation biofuels, as explained by Guilera, the IREC researcher, who adds that if 'direct competition is not prohibited, first-generation biofuels could gain ground'.

Right now, in Spain, most second-generation biofuels are produced on Spanish or European land, but a large part of the raw materials used for this come from imports from non-European countries, according to data from the Ministry for the Ecological Transition, something that also occurs at the European level with used cooking oil, according to research by the NGO Transport & Environment (T&E). This makes traceability difficult. Ensuring that its origin is waste and that it therefore meets sustainability standards is complex, Ecodes points out in its report. In fact, in December 2024, T&E reported fraud involving the use of virgin palm oil sold as used oil.


Where do Spain's biofuels raw materials come from?
Most of them come from non-EU countries, mainly out of Asia
Biodiesel
80%
60%
40%
20%
0%
28,87%
34,82%
11,57%
19,73%
5,01%
China
Indonesia
Malaysia
Other
Spain
Hydrotreated vegetable oil
6,36%
70,05%
10,22%
4,68%
8,69%
China
Indonesia
Malaysia
Other
Spain
HEFA (aviation)
0,06%
36,83%
63,11%
Egypt
Indonesia
Spain
Bioethanol
22,16%
3%
6,74%
4,94%
28,32%
28,3%
6,54%
Brazil
Other
Poland
Romania
Spain
Ukraine
United States
Biopropane
3,99%
76,71%
5,83%
3,22%
10,25%
China
Indonesia
Malaysia
Others
Spain
Source: Biofuels statistics, Miteco • Credit: Verificat.cat
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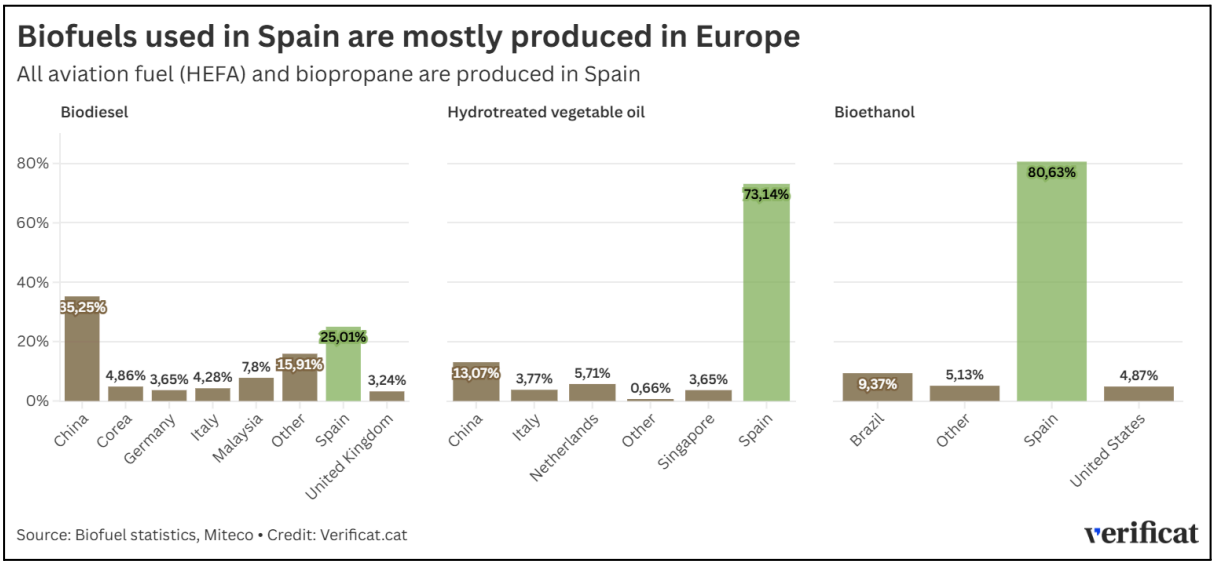
Biofuels used in Spain are mostly produced in Europe
All aviation fuel (HEFA) and biopropane are produced in Spain
Biodiesel
80%
60%
40%
20%
0%
35,25%
4,86%
3,65%
4,28%
7,8%
15,91%
25,01%
3,24%
China
Corea
Germany
Italy
Malaysia
Other
Spain
United Kingdom
Hydrotreated vegetable oil
13,07%
3,77%
5,71%
0,66%
3,65%
73,14%
China
Italy
Netherlands
Other
Singapore
Spain
Bioethanol
9,37%
5,13%
80,63%
4,87%
Brazil
Other
Spain
United States
Source: Biofuel statistics, Miteco • Credit: Verificat.cat
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Two ideas with over 100 years of history

Biofuels and electric cars are not new alternatives. More than a century ago, at the 1900 Paris Exposition, the Lohner-Porsche, a vehicle powered by an electric motor, was unveiled. The event also showcased the diesel engine running on vegetable oils, designed in 1892 by Rudolf Diesel, who a few years later, in 1912, in Missouri, said: 'The use of vegetable oils for engine fuels may seem insignificant today, but such oils may become in course of time as important as petroleum and the coal tar products of the present times.'

That future has not yet arrived. The low cost of oil and the technical problems of the time made it a difficult path to explore. Now, with the need to combat climate change, those century-old ideas are back in the debate.

Advantages and limitations

The positive aspect of biofuels is that they can be used with the existing vehicle fleet and petrol station network. No major changes are required, as they are generally compatible with both current engines and facilities. The electrification of the European vehicle fleet, on the other hand, requires investment in both infrastructure and drivers and depends on batteries with a significant environmental footprint. In other words, they do not have zero impact either. We must 'take into account the extractivism derived' from the manufacture of electric vehicles, which could pose a major problem in the future, points out Berta Roset Pérez, PhD candidate at the Institute of Environmental Science and Technology at the Autonomous University of Barcelona (ICTA-UAB), specializing in the social impact of biogas and the energy transition.

Another necessary change involves adapting the road network. In fact, the EU has a specific legislative package to ensure the presence of recharging stations throughout its territory. Specifically, it envisages that by the end of this year there will be an electric recharging point every 60 kilometres on major roads.

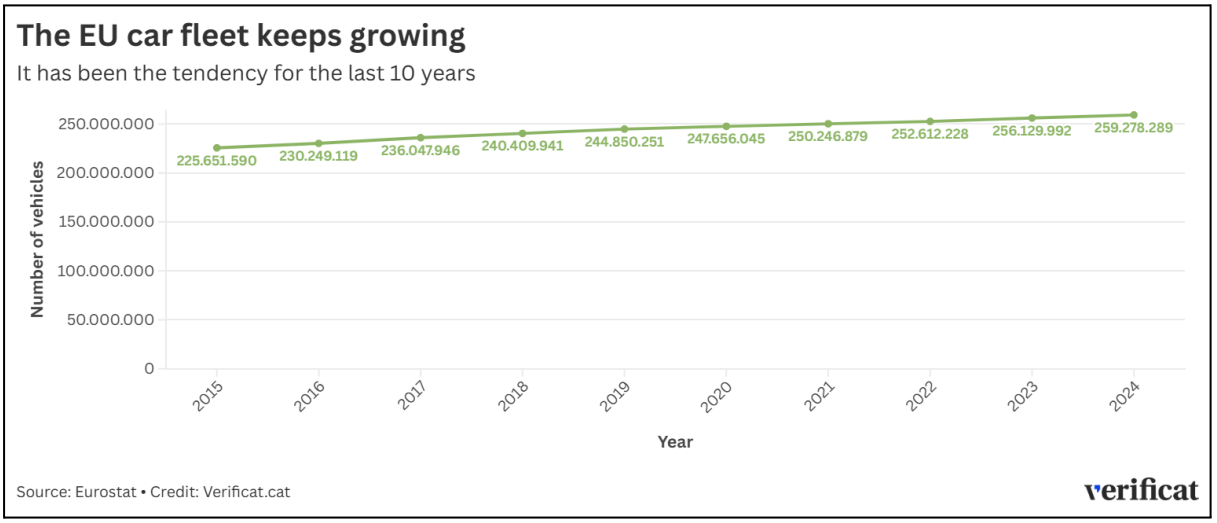
Despite these comparative advantages, biofuels have certain limitations, such as low production capacity. The Ecodes report estimates that more than 57 million tonnes of fossil fuels will be consumed in Spain in 2023, while 'the largest [biofuel] projects in Spain [...] estimate up to 3,850,000 tonnes per year [less than 4 million] of biofuel production'. With these figures, Spain's biofuel supply accounts for only 7% of demand.

In fact, the International Energy Agency (IEA) predicts in a 2024 report that global bioenergy will slow down until 2030 as a result of 'a lack of public policy support'. The European Court of Auditors, in an audit of EU support for biofuels, seemed to agree with this argument. It stated that 'the EU's biofuel policy lacked stability' and that a clearer 'long-term strategic approach' was needed. It also added that 'sustainability issues, biomass availability and costs are limiting the deployment of biofuels'.

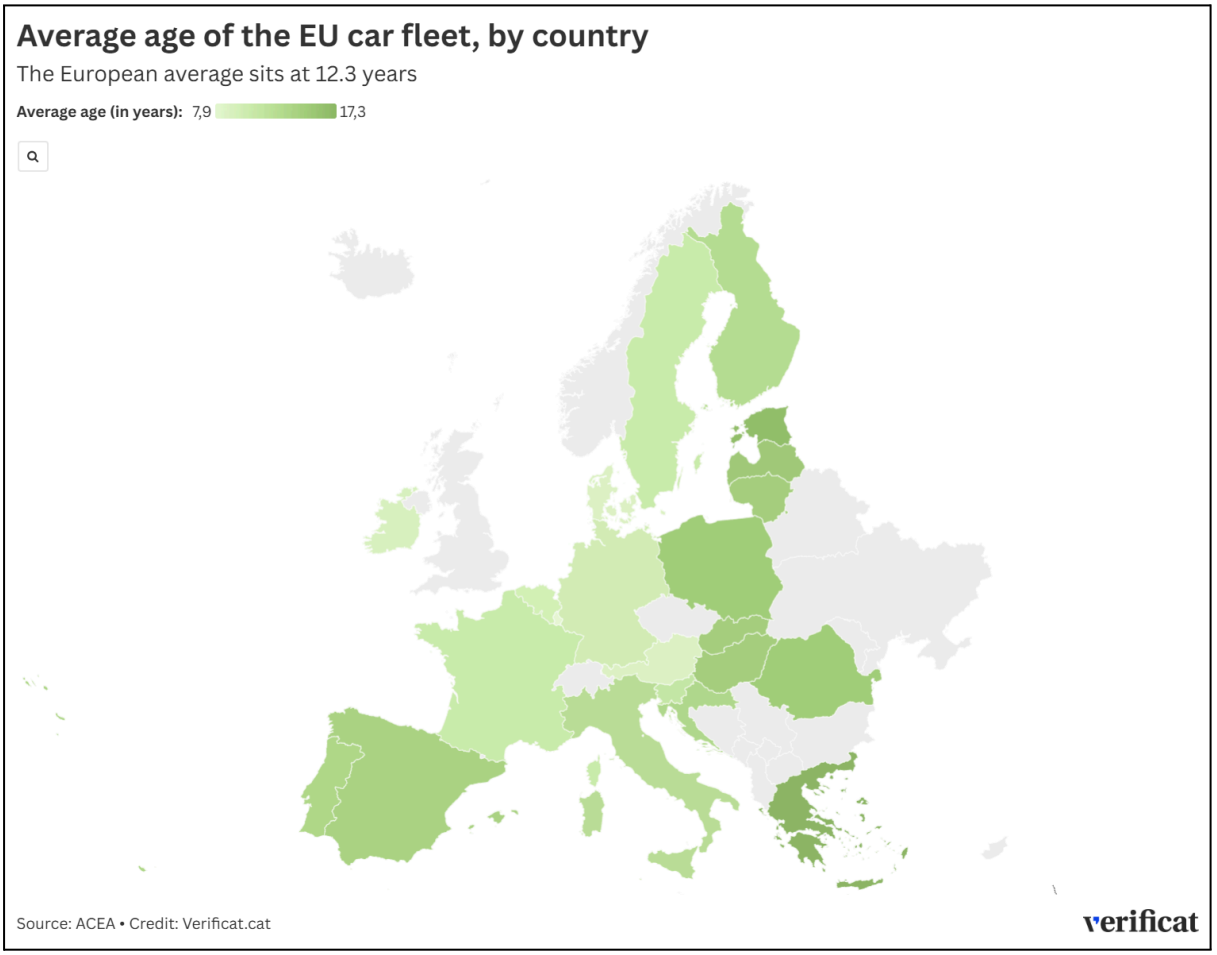
Roset Pérez, from ICTA-UAB, agrees with some of these approaches. 'The potential for biogas production is not sufficient for current consumption,' she says. Her proposal is based on degrowth, which in the automotive sector translates into 'reducing road transport and promoting public transport'. This trend is completely opposite to what we are seeing today.

Biofuels, electricity, and road transport

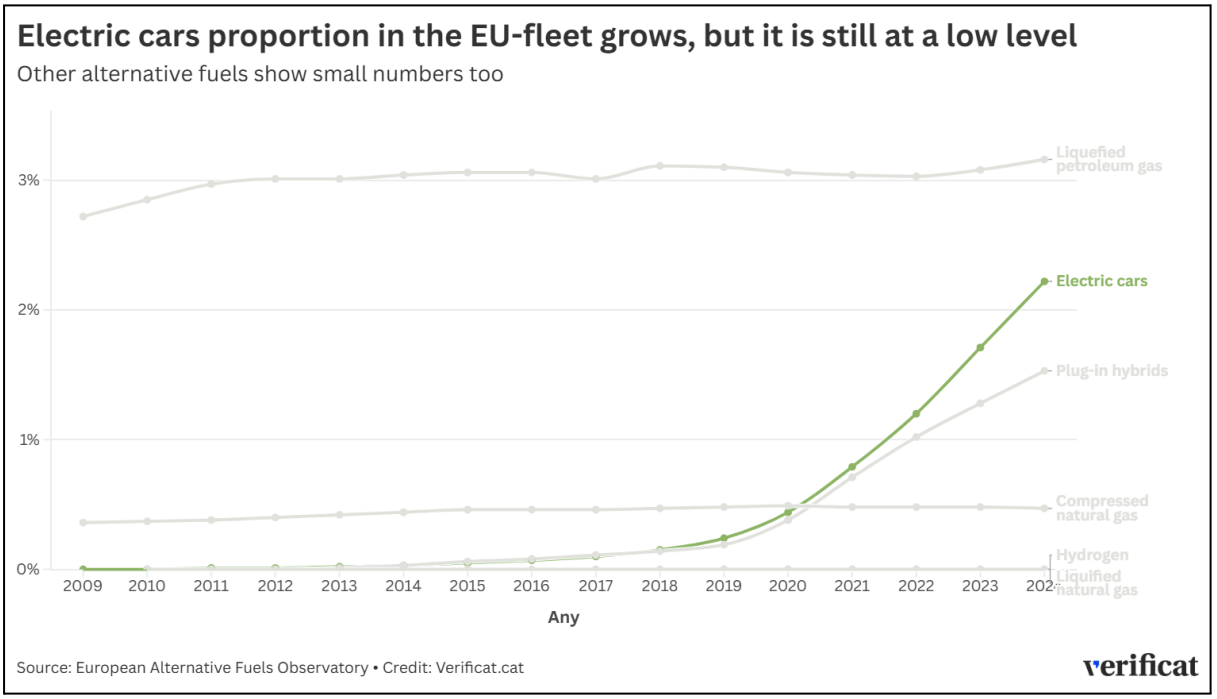
The number of cars in the European Union is increasing, a scenario that applies to practically all Member States, according to Eurostat data.



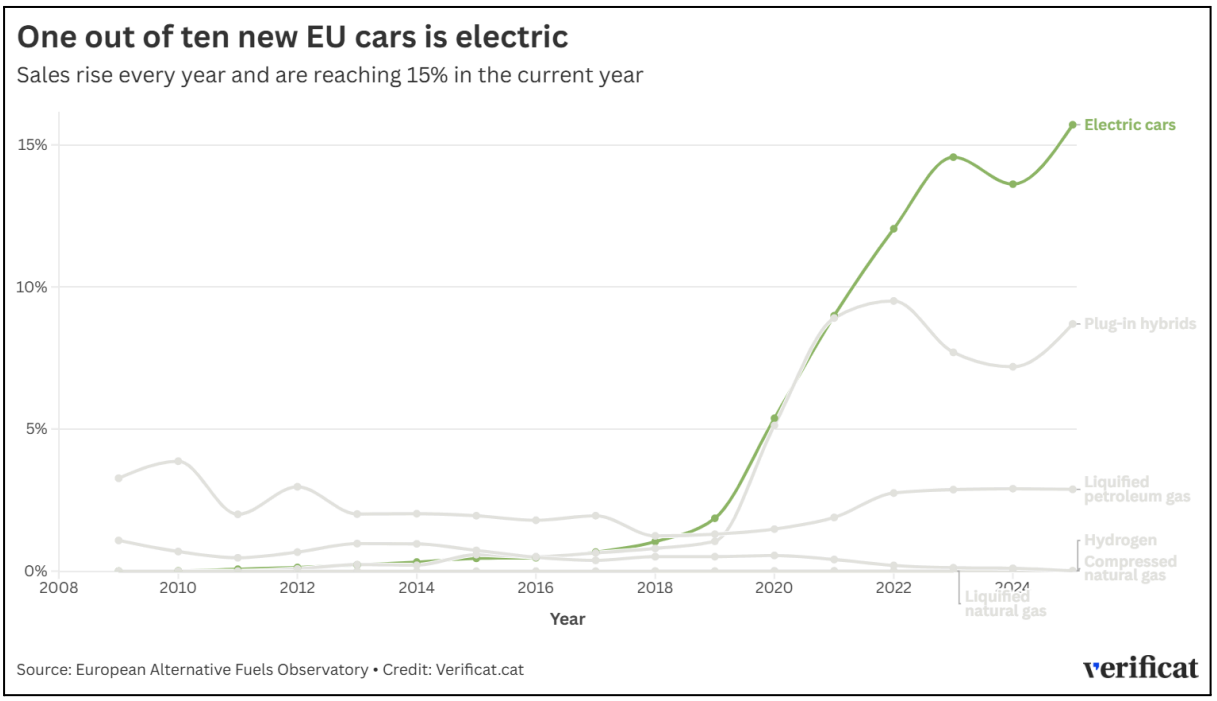
The average age of the fleet is 12.3 years, according to the European Automobile Manufacturers' Association (ACEA, for its acronym in French), although the figure varies substantially between countries: most of those bordering Russia have cars with an average age of around 15 years. Greece is the most extreme case, with a fleet that is over 17 years old on average. In contrast, in countries at the other end of the spectrum (geographically and economically), such as Austria, Belgium, Denmark and Ireland, the average age is less than ten years.



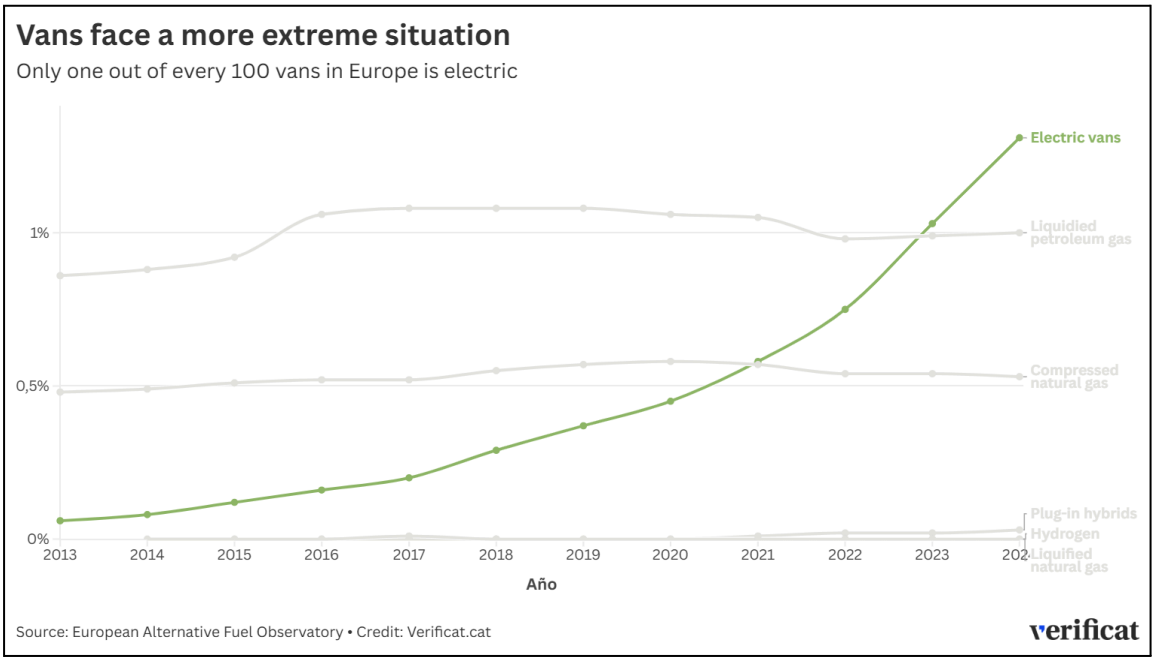
In this growing car fleet, fossil fuels continue to dominate the market. Only 2% of cars in use in the EU are electric, although their presence is increasing, according to [data from the European Alternative Fuels Observatory](#).

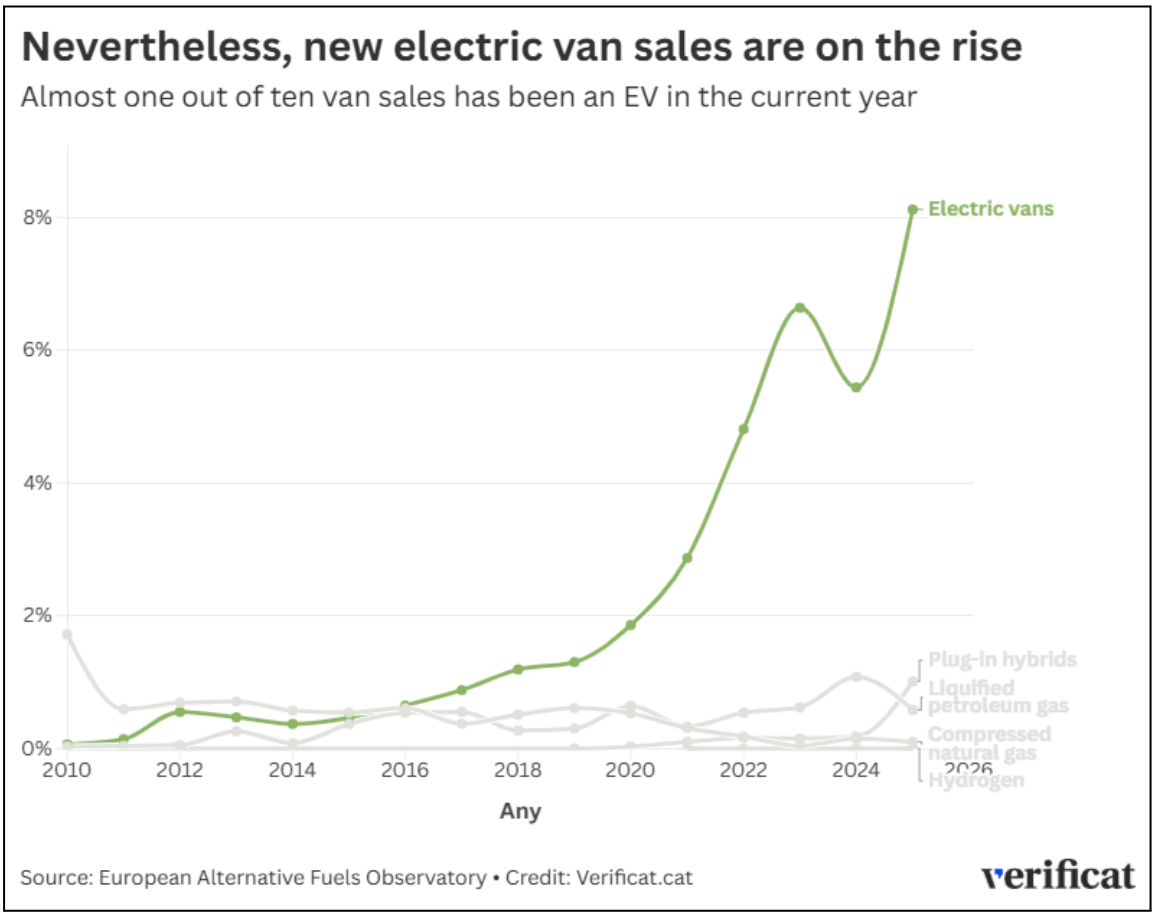


Over 10 million new vehicles were registered in 2024. 1.5 million of them (13%) were fully electric. The rest mainly use petrol or diesel, either in combustion engines or hybrids.



The situation is somewhat more extreme in the case of vans. Electric vehicles account for just over 1% of those in use, and represented 5% of new registrations in 2024.

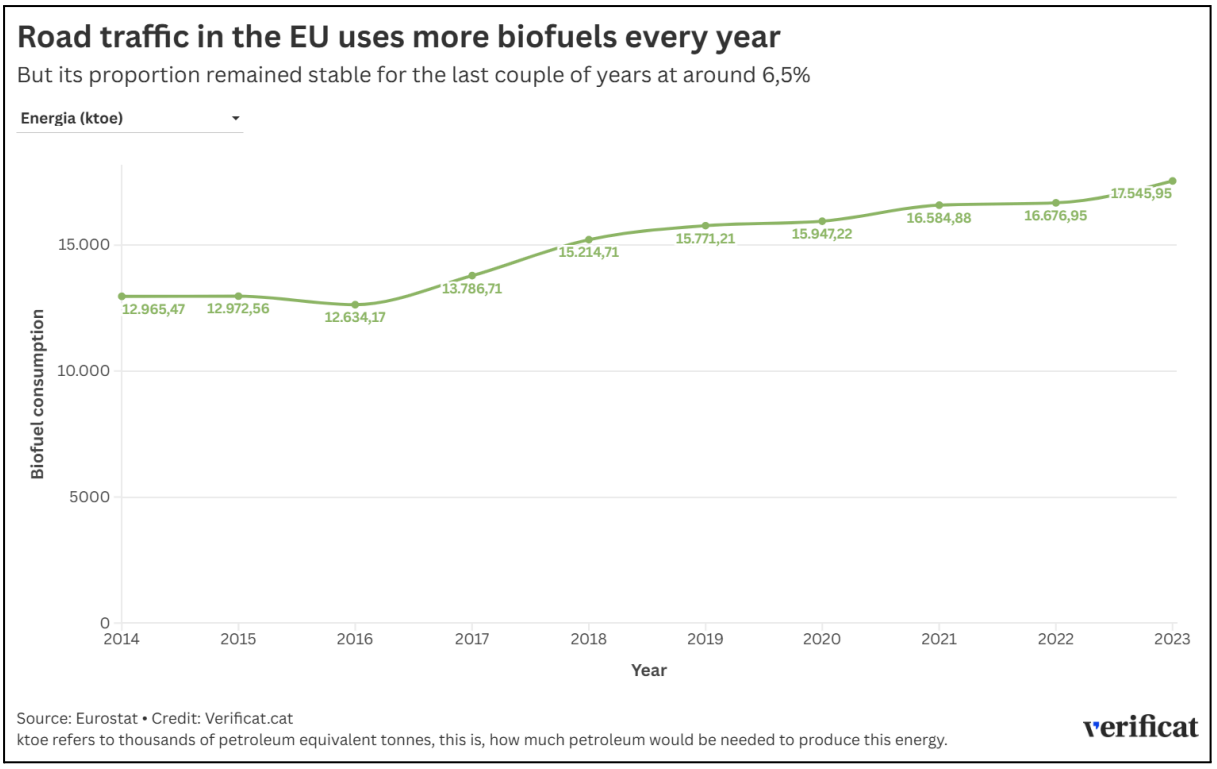


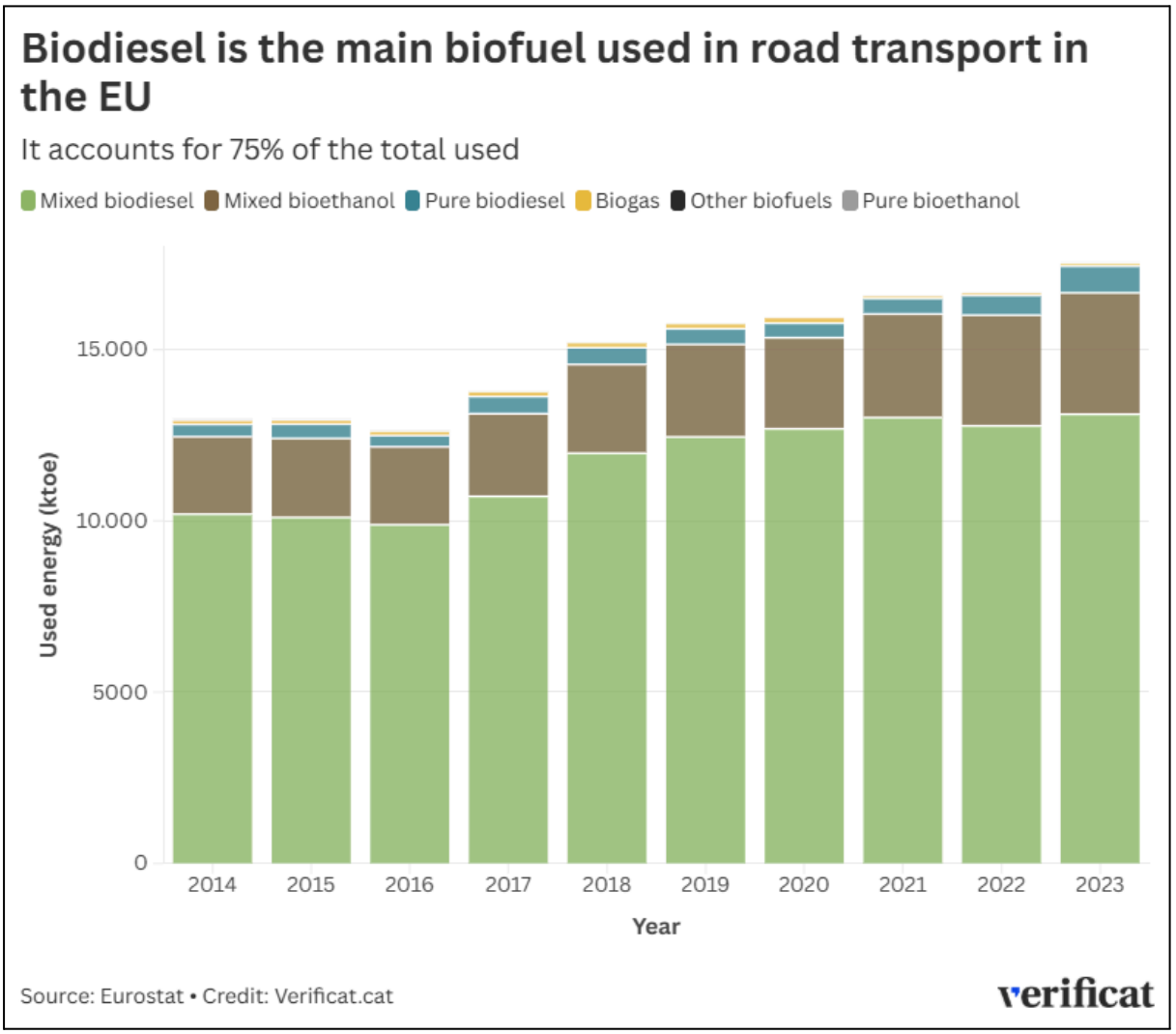


What about biofuels? Their use cannot be determined based on the type of vehicle engine, because they are used in combustion vehicles. Bioethanol, for example, can be mixed with petrol, and biodiesel with conventional diesel. In fact, hundreds of Spanish petrol stations now offer a mixture of traditional and biofuel.

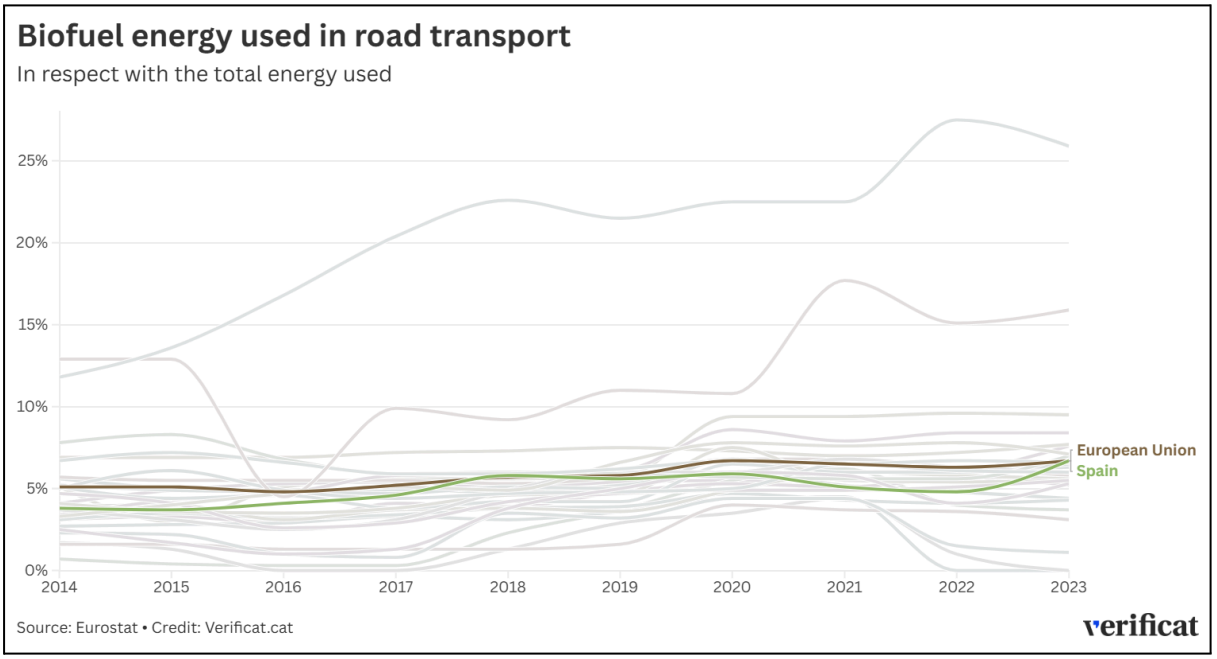
The 27 Member States implemented regulations to promote the use of this type of bio-based product back in 2009. Specifically, they established that at least 10% of the total fuel consumed in 2020 by each Member State had to be biofuels. However, this target was defined as binding only 'provided that production is sustainable, second-generation biofuels are commercially available and Directive 98/70/EC of the European Parliament and of the Council [...] relating to the quality of petrol and diesel fuels is amended accordingly to allow for appropriate blending levels'.

In 2023, 6.7% of the energy used in road transport in the European Union was provided by biofuels or renewable products, according to the latest data from Eurostat. The rate has remained stable at around 6.5% since 2020.





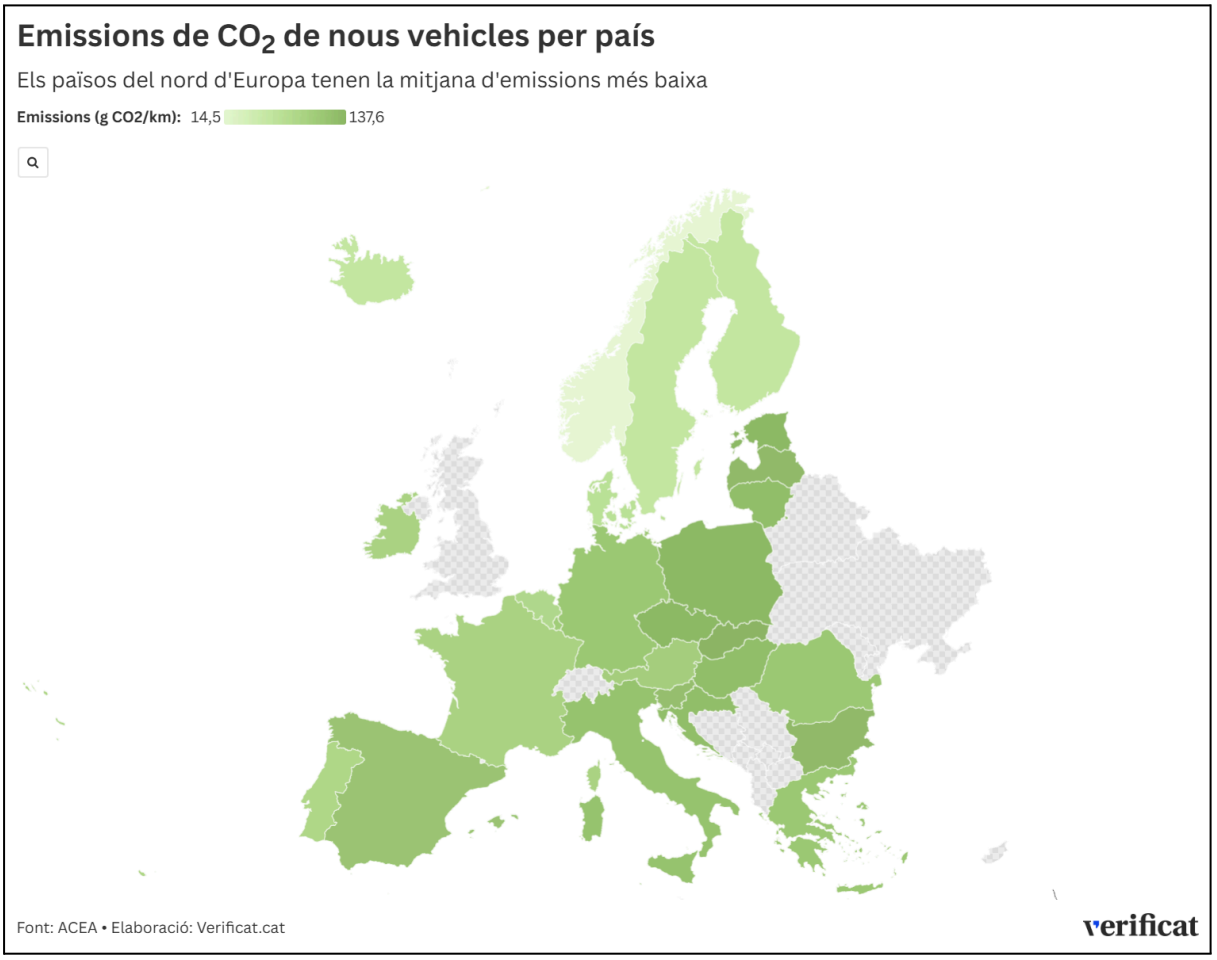
In 2023, Sweden led the EU (25.9% of the energy consumed by the country in road transport came from renewable sources), followed by Finland (15.7%) and Belgium (9.5%). Spain (6.7%) was on a par with the EU average, while Latvia (1.1%), Croatia and Greece (both 0%) were at the other end of the scale.



Timeline of a negotiation

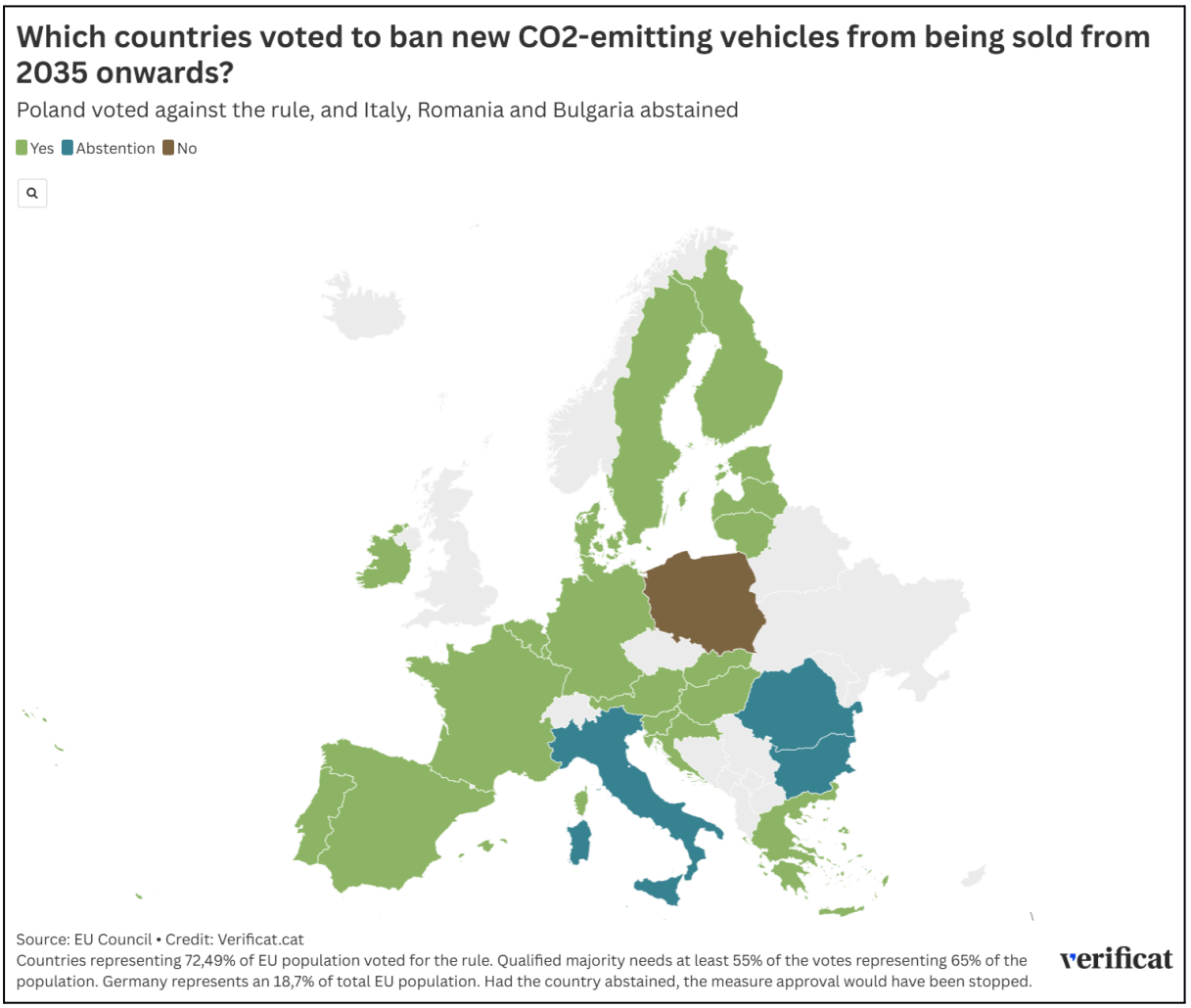
Besides pressure from the automotive industry, the regulation that will ban the sale of cars and vans that generate emissions in 2035 has been facing opposition from some European countries for years. In 2022, Italy, Portugal, Slovakia, Bulgaria, and Romania asked to delay the ban until 2040, according to Reuters news agency at the time. The following year, when the regulations seemed to be concluded and had been approved by the European Parliament, the Commission and the Council of Europe, the vote among the ambassadors of the 27 Member States had to be postponed due to threats that it would not go ahead, as reported by Euronews.

Germany, Europe's automotive giant, led a group of countries against the 2035 ban, which also included Italy, Bulgaria and Poland, and which, with their joint opposition or abstention, would have had the power to stop the legislation, because any regulation needs the votes of 55% of the countries representing at least 65% of the European population to be approved by the Council. According to the European Automobile Manufacturers' Association (ACEA, for its acronym in French), these last three countries stand out for having some of the highest levels of emissions in new vehicles.



Finally, Germany managed to add e-fuels as an authorised exception for new vehicles registered after 2035 at the last minute, and ended up voting in favour of the regulation. These synthetic fuels are not yet produced on a large scale and are expensive. The NGO Transport & Environment believes that their presence in the European car fleet will be negligible by 2035.

In the final vote, the only country that went all the way was Poland, which voted against the measure. Italy, Bulgaria and Romania abstained.



The reasons for opposing the regulation were not the same in each of the countries in that bloc. Bulgaria, for example, was reluctant to completely ban traditional fuels because of the high cost of electric vehicles. According to the EU Urban Mobility Observatory, in 2022 economic capacity was 'one major reason for the low uptake of electric vehicles' in the country. The Observatory pointed out that 'average prices for electric vehicles are higher than those for conventionally fuelled vehicles, and average household income in Bulgaria is among the lowest in the EU'. Romania gave similar reasons.

Another point of contention was biofuels, which, similar to e-fuels, were promoted by some groups as a sustainable alternative to petrol, arguing that they could also be a solution for achieving carbon neutrality. In this case, the pressure did not bear fruit, and biofuels were not included as an exception to the regulations, although they are promoted by the EU through other regulations.

Italy has been strongly committed to this sector for some time. In a statement prior to the approval of the regulation, they called for 'renewable fuels' to be included among the exceptions, a concept that usually encompasses biofuels, green hydrogen and the aforementioned e-fuels, according to the International Energy Agency (IEA).

Poland (whose Climate Minister, Anna Moskwa, stated that they would take the 2035 ban and other measures to the European Court of Justice, as reported by Reuters) and Finland (which requested that biomethane be specifically included as an exception) conveyed similar messages. The three countries mentioned the economic impact of electric vehicles on citizens and the difficulty of the EU's technological adaptation to support their positions.

3.Narratives

Verificat has reviewed the communications of several political lobbying initiatives promoting biofuels at both the continental and Spanish levels, such as Tour d'Europe and Plataforma para los Combustibles Renovables (Platform for Renewable Fuels), as well as the websites of five of the largest oil companies in the EU (Shell, TotalEnergies, Eni, Repsol and Moeve, formerly Cepsa), to characterise their messages on the subject. These are the three largest companies in the sector with roots in the EU, according to Forbes' Global 2000 list, and the two leading Spanish entities.

Petrol companies analysed in the report

With economic data from *The Global 2000* compiled by Forbes

Company	Based in	Sales	Profits	Assets	Market value
Shell	United Kingdom (with roots in the Netherlands)	283.780 M$	16.120 M$	387.610 M$	195.550 M$
TotalEnergies	France	195.600 M$	15.780 M$	285.490 M$	125.830 M$
Eni	Italy	94.930 M$	2.790 M$	156.040 M$	42.690 M$
Repsol	Spain	61.790 M$	1.900 M$	65.430 M$	14.100 M$
Moeve (Cepsa)	Spain	No data	No data	No data	No data

Source: The Global 2000, Forbes • Credit: Verificat.cat
Forbes uses the public financial data of the last 12 months since April 2025. Moeve (Cepsa) does not appear in the list.
verificat

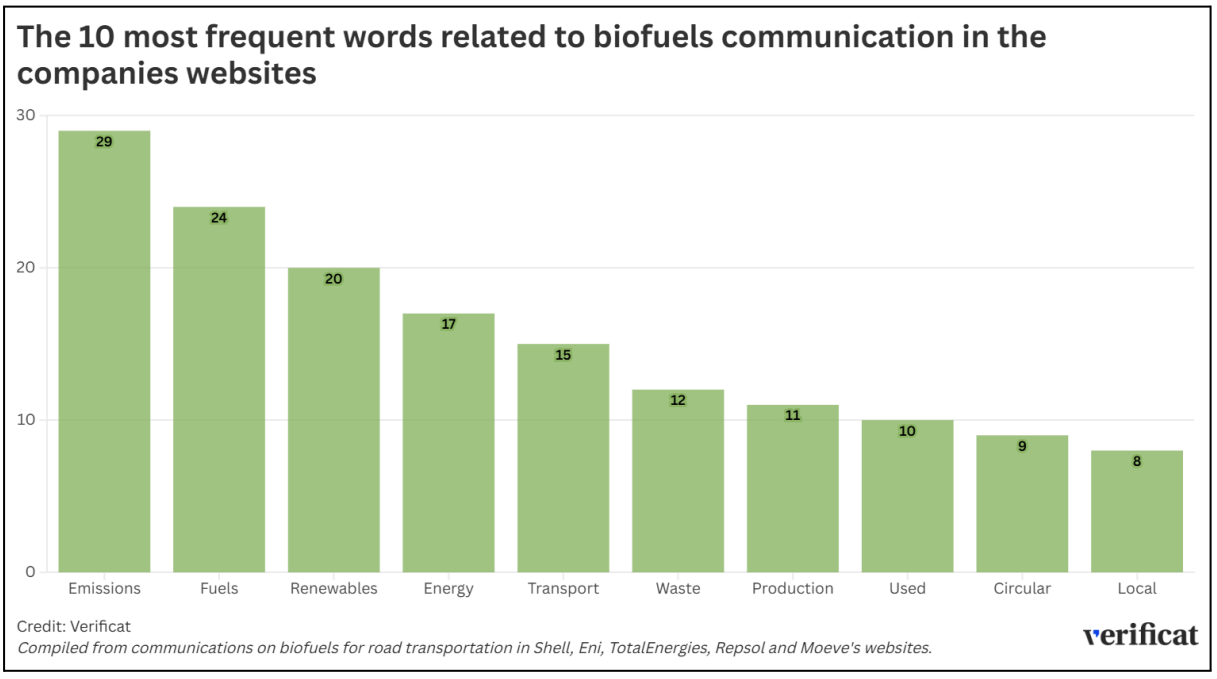
The communication campaigns of these entities use generally vague and unspecific concepts that make factual verification difficult because, strictly speaking, they do not include falsehoods. Yet, they promote a vast optimism towards biofuels with messages mainly highlighting their positive aspects, without mentioning their limitations and controversies. The four main narratives they use are also present in social media, as revealed by the analysis of messages on this subject on X (formerly Twitter), where they contribute to the idealisation of these products. Some social media users take this idea a step further and vow for biofuels as a current, real and more sustainable alternative to electrification for road transport decarbonisation, sometimes using debunked misinformation to make their points.

Feelings towards biofuels are highly polarised in X and reveal a lack of knowledge on the subject. In parallel to the idealistic messaging, posts that completely demonise their environmental and social impact are also common, usually falling onto an imprecise generalisation that considers all biofuels to be first generation (i.e., made out of edible crops).

The most optimistic messages are also finding their way into European politics, through countries that defend this supposed alternative for achieving decarbonisation.

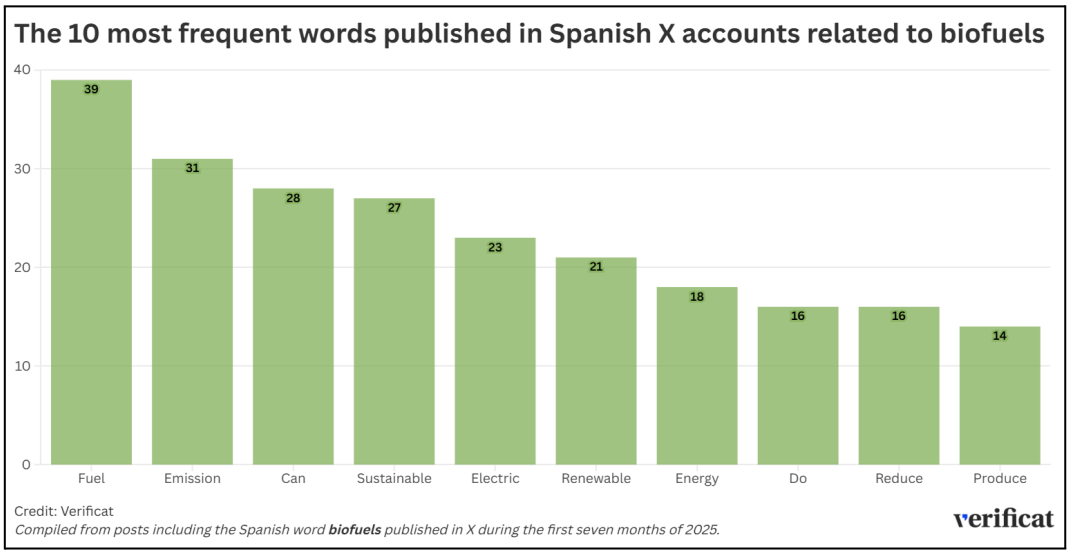
The message changes depending on the source

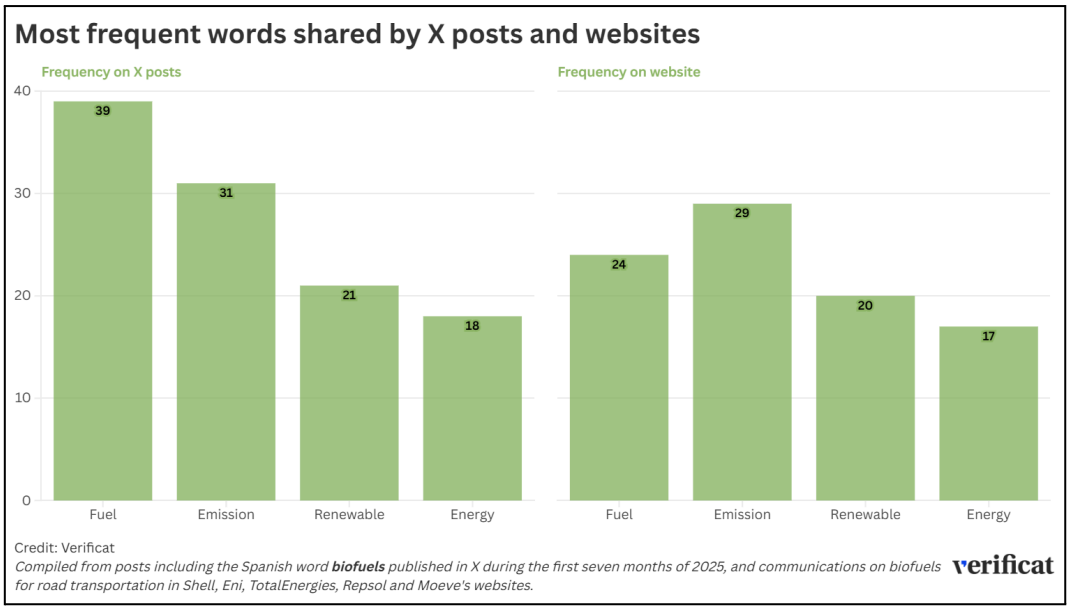
By reviewing the words most commonly used by both lobby groups and companies on their websites when talking about biofuels, it is possible to reconstruct a shared message: that these fuels are a renewable energy source, reducing emissions and promoting a circular system at two levels (the life cycle of biofuels themselves and the type of economy they promote), focusing on the reuse of waste as raw material (i.e., they focus on the exploitation of second-generation biofuels).



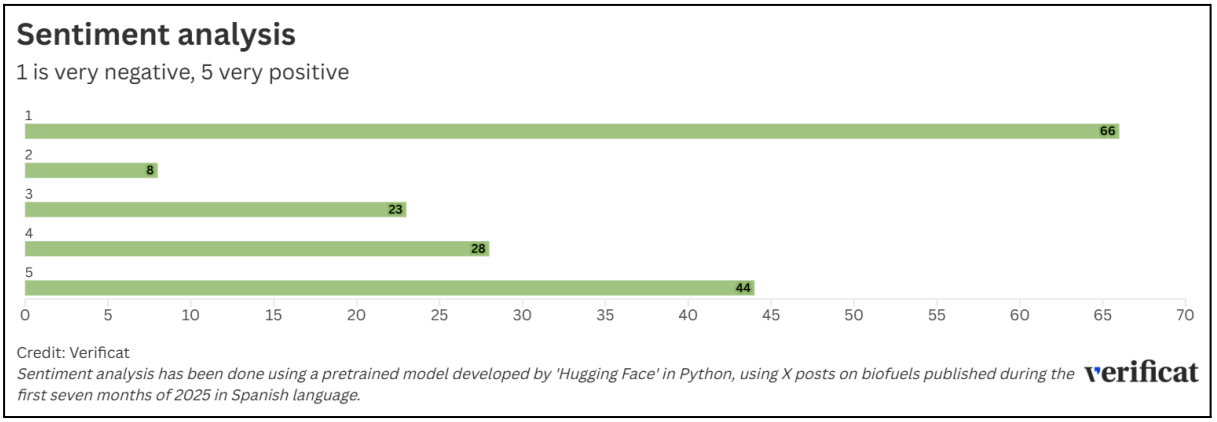
On social network X, meanwhile, there is little conversation about biofuels. The EFCSN fact-checkers have not analysed any information related to the topic so far this year, according to the publications compiled in the EuroClimateCheck repository, of which Verificat is a member. To prepare this report, we analysed 170 Spanish messages that explicitly included the term 'biofuels' in the first seven months of 2025.

Often, these publications use similar terminology to that of oil companies, but with added distortion and, often, ignorance. The main commonality in part of the messaging is the general framework: they are presented as fuels that contribute to reducing emissions and are directly related to renewable energies.





The polarisation is palpable when analysing the sentiment of these messages. Some are mainly idealistic, presenting these fuels as a current and viable alternative to the electrification of land transport. They also sometimes argue that electric vehicles are more polluting than fossil fuels and claim that they are dangerous because they catch fire easily. Both are misleading arguments that have been previously disproved by Verificat, as well as by other EFCSN members as Ostro or Maldita. We have also found examples of techno-optimism, which defend the idea that any scientific discovery about a new way of obtaining biofuels can be translated into a viable, scalable and applicable option today.



At the opposite end of the spectrum are publications that highlight the problems associated with first-generation biofuels, such as deforestation and rising food prices, and generalise them by applying them to all alternative fuels. In other words, many of the profiles analysed understand that all biofuels use food as raw material.

In the political arena, we have also observed, on some occasions, the use of terminology similar to that used in corporate digital communications. This is the case in Italy, which is leading an international initiative to promote these products, and in the European People's Party, which considers that they 'play a role in reducing CO2 emissions'. In Spain, both political bodies, such as the Ministry for Ecological Transition, and leaders of parties such as the People's Party, have also supported them in joint events with the major oil companies.

These are the main verified narratives:

EXPLAINER | Biofuels are a renewable and sustainable fuel

A common feature of the oil industry's communications about biofuels is that they are often paired with words like ‘renewable’ or ‘sustainable.’ These are adjectives that are also used by public bodies such as the European Commission and the International Energy Agency (IEA), as well as Italian and Spanish political figures. In fact, Repsol's press office refers to the Renewable Energy Directive (RED) to justify that it is ‘renewable energy’, because the directive defines it as energy that comes from various sources, including ‘biomass, landfill gas, sewage treatment plant gas, and biogas’. However, these expressions need to be contextualised, because they require very specific technical conditions to be met.

According to the United Nations, renewable energies derive ‘from natural sources that are replenished at a higher rate than they are consumed’. The organisation cites the sun, wind and bioenergy as examples, although it points out that the latter ‘should only be used in limited applications, given potential negative environmental impacts related to large-scale increases in forest and bioenergy plantations, and resulting deforestation and land-use change’.

This is the point emphasised by the researchers interviewed by Verificat, who warn that whether biofuels can be considered renewable depends on the quantity and rate at which they are consumed. Unlike wind or sunlight, biomass (the raw material that produces these fuels) is finite: producing large amounts of first-generation biofuel can encourage deforestation, according to a study by the Center for International Forestry Research (CIFOR), and the waste available to produce second-generation biofuels is limited.

In line with this, there are initiatives such as Repsol's, which offers its customers in different autonomous communities in Spain discounts on refuelling if they deliver used cooking oil to collection points made available at its petrol stations for recycling. However, the NGO Transport & Environment stated in a 2024 report that European countries consumed eight times more used cooking oil to make biodiesel in 2023 than

their maximum collection potential, making imports essential. Both the IEA and the European Court of Auditors noted in separate reports that much of this raw material used in Europe comes from Asia, particularly China.

'The word "renewable" should not only refer to whether the resource becomes available again within a certain period of time, but also to what environmental cost,' says climate communicator and doctor of biodiversity Andreu Escrivà.

The expert is also critical of the concept of 'sustainable', which he considers meaningless in his book Contra la sostenibilidad (Against Sustainability). The Royal Spanish Academy (RAE, for its acronym in Spanish) defines it as 'that which can be maintained over a long period of time without depleting resources or causing serious damage to the environment'. This concept, extended to 'sustainable development', was defined in 1987, according to the European Union, and refers to 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. As with the concept of 'renewable', in the case of biofuels this condition is only met if the rate of extraction and production respects the natural rates of biomass regeneration. Otherwise, resources will be depleted.

The use of terminology in political spheres

Italy is currently one of the leading EU countries committed to biofuels. It is the second largest importer of this product in the Eurozone and the fourth largest producer. This is also backed up by a political strategy that's leading to several actions. One of the most notable is its role as chair, until 2027, of the Biofuture Platform Initiative (BfPI) of the global Clean Energy Ministerial (CEM) forum, a meeting point for accelerating the development and implementation of bio-based fuels globally.

In the official statement announcing the new presidency, Gilberto Pichetto Fratin, Italian Minister for the Environment and Energy Security, stated that 'We are at a unique moment to promote policies and initiatives that will further encourage the use of sustainable biofuels as an effective and strategic solution in all sectors, including those that are difficult to decarbonise and transport, including road transport, in order to address global

sectoral challenges and promote a safe and sustainable energy transition through a concrete and non-ideological approach.'

In Spain, former Minister for Ecological Transition Teresa Ribera made clear her support for biofuels using similar terms. The press conference took place in 2024, in Palos de la Frontera (Andalusia), during the groundbreaking ceremony for a joint project between Moeve (formerly Cepsa) and Bioils. There, the former minister assured that 'biofuels will be key in the decarbonisation of sectors such as maritime transport and aviation'. At the same event, Juan Manuel Moreno Bonilla, president of the Andalusian Regional Government for the People's Party, added that Andalusia was ready to become 'a major producer and distributor of clean energy on the continent' and highlighted that the new plant that was beginning to be built was 'a clear and very valuable example of the circular economy'.

EXPLAINER | Biofuels are clean fuels; they do not pollute or pollute very little

Another key narrative is to define biofuels as products that do not emit CO_2 (or do so in very limited quantities), and are therefore considered 'carbon neutral' or 'clean energy' if they comply with European directives. This promise appears in both the Tour d'Europe and Plataforma para los Combustibles Renovables (Platform for Renewable Fuels) initiatives, as well as on most of the websites of the five major oil companies analysed. The TotalEnergies press office points out that biofuels emit more than 50% less CO_2 than their fossil fuel equivalents over their life cycle, which, according to them, makes them a partial route to decarbonisation for liquid fuels.

Repsol, for its part, claims in its website that one of the strengths of this product is that it reduces emissions because 'the CO_2 released during its use is equal to the CO_2 absorbed by the organic matter from which it is derived during its useful life'. Moeve describes them as 'the current solution for decarbonising transport'. Their press department adds the claim is based in their ability to reduce up to 90% of net CO_2 emissions compared to fossil fuels over their whole life cycle. Shell considers them key in the transition 'towards

net zero emissions' and, in its strategy report for the energy transition for 2024, includes them among 'low-carbon products'.

The idea is also supported by the European People's Party in its proposal to 'secure the competitiveness of the European automotive industry'. It calls for exemptions for biofuels and other alternative fuels in the ban on the sale of now combustion engine cars and vans by 2035. This proposal is backed by the German Association of the Automotive Industry, which, in a statement, called for greater focus on 'renewable fuels' 'considering their average impact on CO_2 reduction'. Poland and the Czech Republic support the revision of the law, according to Reuters and Politico, but we have not found any recent specific communications on biofuels.

Polish MEP Dariusz Joński cited both infrastructure and economic challenges to ask for a relaxation of the ban. He sees it as an unrealistic plan, according to local media (1, 2, 3) made available to Verificat by Demagog, a Polish fact-checking agency part of EFCSN. His arguments are similar to the ones defended by the Polish Automotive Association.

It is true that biofuels can emit much less CO_2 than fossil fuels, but they are by no means a zero-emission product. When this type of fuel is burned, vehicles release into the atmosphere an amount of carbon dioxide similar to that stored by the organic matter from which they originate during their growth. In other words, on paper, the balance is zero: as much CO_2 is emitted as is captured. However, this comparison only scratches the surface, because biofuels emit greenhouse gases even before they are burned.

The Massachusetts Institute of Technology (MIT) Climate Portal and experts consulted by Verificat point out that, when measuring emissions from these fuels, it is essential to include those associated with their production, transport and processing, among others. In other words, their entire life cycle must be analysed. This 'includes emissions from the farm machinery used to harvest them [the raw materials], the gasoline burned to move them to a processing facility and, in some cases, it can also include the fossil fuels used to run the processing plant', according to MIT.

Taking all these factors into account, in the best-case scenario, biofuels can reduce emissions by up to '80-85%' compared to traditional fuels, according to Jordi Guilera from

IREC, in conversation with Verificat. This reduction is lower in the case of first-generation biofuels and higher in second-generation biofuels, but it varies greatly depending on the raw material used and the study evaluating it, as reflected in various systematic reviews (1, 2). There is no consensus on a specific figure, and when there is deforestation and land use change, emissions can be even higher than in the case of oil. Therefore, claiming biofuels reduce emissions compared to fossil fuels is not always precise, as this depends on its origin and production.

Is that enough to consider them a 'clean fuel' or to say that they produce 'clean energy'? The International Energy Forum defines the concept as 'energy made without causing harm to the environment', while MIT talks about 'energy sources that produce no climate-warming greenhouse gas emissions'. The university includes biofuels here only 'in some circumstances', and newspaper articles such as this one from the Associated Press consider that, to be considered as such, they must be made from 'waste or inedible vegetation, with renewable energy to power the production, and have little or no greenhouse gas emissions'.

The terms have another meaning for the World Health Organisation (WHO) in the household context. The organisation considers clean fuels to be 'those that attain the fine particulate matter ($PM_{2.5}$) and carbon monoxide (CO) levels recommended in the WHO global air quality guidelines (2021)' for heating, cooking and lighting. In general terms, these are fuels that do not emit pollutants.

However, available evidence shows that biofuels produce local pollution on a similar scale to conventional fuels when burned, as pointed out by José Ramón Galán-Mascarós, an ICREA researcher at the Catalan Institute for Chemical Research (ICIQ), who investigates the applications of inorganic materials for renewable energies. If large quantities of biofuel are burned in a given area, for example, a city, pollution will increase significantly there, even though globally the balance will be neutral, he explains. 'Atmospherically, it has no impact, but in the city it does,' he says.

This is illustrated by a review of the available evidence carried out by the UK Air Quality Expert Group, which assessed whether the use of biofuels reduced local pollution. The study concluded that blending them with petrol or diesel at up to 15% has little effect on

air quality: in other words, burning biofuels still emits pollutants such as nitrogen oxides (NOx), carbon monoxide and particulate matter (PM), among others, which traditional fuels also emit and are known to be harmful to health.

First-generation biofuels are still in use

Many posts on social media confuse biofuels in general with first-generation biofuels. However, the EU is committed to second-generation and synthetic biofuels and advocates moving away from those based on food crops. Even some of the major oil companies include this in their communications. The TotalEnergies press office has told Verificat that it excludes first-generation biomass, which competes with food consumption, from its biofuel production. Shell, for its part, states on its website that one of its business principles is to work to ensure that its supply does not involve deforestation. It also states that it 'tries' not to source renewable components or feedstocks associated with any violation of human rights.

Yet, only 40% of the biofuel used in the European Union in 2022 came from waste utilisation, according to an analysis by the IEA. In other words, most of the raw materials used are still cultivated.

This is reflected in the case of Spain. Data from the Ministry for Ecological Transition show that nine out of every ten litres of bioethanol sold come from corn and the rest from sugar cane, while half of the hydrobiodiesel consumed uses oil extracted from palm clusters. This raw material is already regulated by the EU to reduce its impact on deforestation.

Even among second-generation biofuels, such as the highly acclaimed used cooking oil, virgin palm oil is sneaking in, as demonstrated by the environmental NGO Transport & Environment, which uncovered fraud in the product imported from Asian countries, a growing trend in the EU. The European Court of Auditors admits that there is a 'proven risk of fraud' for the product because 'it is difficult to confirm that imported used cooking oil, given its characteristics, is a waste product'. In the case of biodiesel marketed in Spain, three out of every four kilos of raw materials come from Indonesia, China or Malaysia, and almost 40% is produced from used cooking oil.

The European Parliament already warned of this reality in a 2017 report on the relationship between palm oil and rainforest deforestation. The document stated that the energy sector was responsible for 60% of EU palm oil imports in 2014 and that 46% 'was used as fuel for transport'. It also estimated that by 2020, one million hectares would have been converted to produce palm oil for biodiesel on a global scale, '0.57 million of which will be converted from Southeast Asian primary forests'.

Last February, the Federation of Consumers and Users (CECU), Ecologists in Action and Greenpeace Spain filed a complaint against Repsol with the National Commission for Markets and Competition. They accused the company of concealing information 'in its public communications and advertising' about 'deforestation and other environmental and social impacts caused by the production of palm oil used in the manufacture of its biofuels (biodiesel)'. The oil company's press office states that Repsol prioritises the national and European origin of the raw material used and resorts to imports when necessary, guaranteeing the traceability and sustainability of all batches back to their origin. According to the company, the raw material used is regulated, supervised and certified.

EXPLAINER | Biofuels promote the local circular economy

Another common narrative among pressure groups and oil companies is that biofuels represent a great opportunity to reduce energy dependence by promoting local production and replacing foreign raw materials. The idea of energy independence is also echoed in European and national institutions, especially since Russia's invasion of Ukraine, with the launch of plans such as REPowerEU, which aimed to 'phase out Russian fossil fuel imports', currently frozen by sanctions.

However, data from the Spanish Ministry for Ecological Transition illustrates how, despite the fact that most biofuels used in Spain are produced in the country or in its European neighbours, a large part of the raw materials used to manufacture them come from outside the EU, especially from Asia. An IEA report points out that the situation is similar in Germany and the Netherlands: these are countries that export more biodiesel than they

import, but use raw materials from China to produce it. In fact, the EU has imposed duties on Chinese biodiesel imports in order to prevent dumping or unfair competition.

In the case of bioethanol, the IEA notes that the raw materials tend to come from North American corn.

For its part, the European Court of Auditors concludes in its analysis of European biofuel policies that 'dependence on feedstock imports has increased due to the rising demand for biomass over the years,' and criticises the EU because 'the targets for renewable fuels are set without taking into account the available biomass from sustainable sources'.

Halting the depopulation of rural Spain

In Spain, the oil industry proposes biofuels as a tool in the fight against rural depopulation because, they claim, it contributes to the economic revitalisation of the territory. There are examples of this for both Moeve and Repsol. They vow for these initiatives to have a real economic impact on rural communities where deployment is planned, explains the latter's press department, as well as favour the region development and try to guarantee the benefits will stay there.

This is also promoted through a regulatory framework, both European and national, as set out in the Spanish Government's Biogas Roadmap, which establishes minimum production targets, accompanied by measures to boost investment. This document specifies that biogas 'helps to prevent rural depopulation, creating economic value and employment and offering synergies with the economic recovery needs of areas undergoing a fair transition'.

Despite this, the installation of large-scale plants for this type of fuel, which is used in energy and heat production and as a motor fuel, has been met with resistance in some rural areas of Spain and has sparked protests in various regions, according to the EFE news agency. The NGO Ecologistas en Acción de Valladolid explained in a statement that the plants could contribute to better management of livestock waste and could be

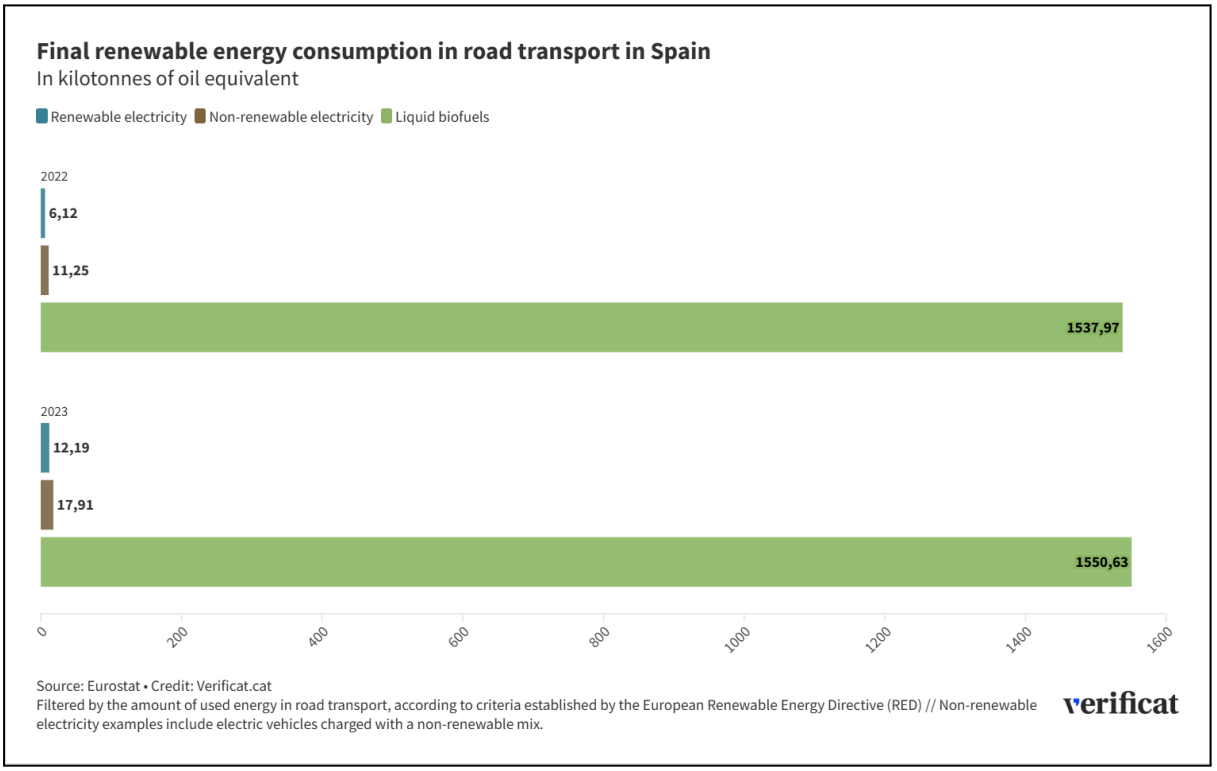
'justified and appropriate' in Castilla y León, but they must be 'subject to adequate and specific regulation that does not currently exist'.

The Stop Ganadería Industrial (Stop Industrial Livestock Farming) platform, which includes more than 90 neighbourhood movements throughout Spain, including some initiatives opposed to biofuels, claims that the local population is not benefiting from these large projects. This is a recurring complaint among movements because, according to Berta Roset Pérez, a doctoral student at the Institute of Environmental Science and Technology at the Autonomous University of Barcelona (ICTA-UAB), who specialises in the social impact of biogas and energy transition, the local population bears the negative effects (bad odours, noise and land occupation), while the benefits are redistributed throughout the country.

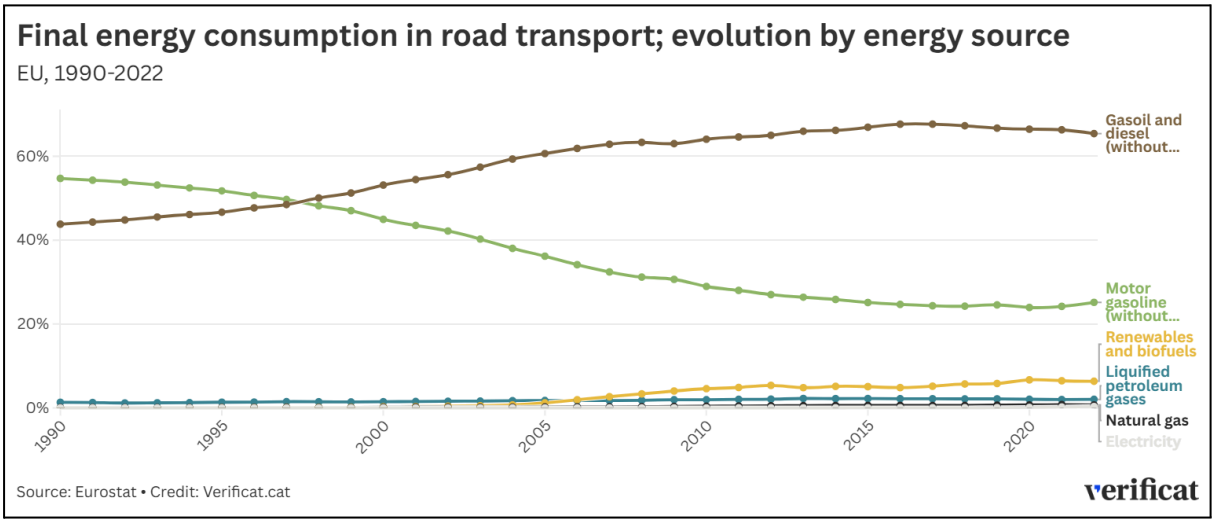
EXPLAINER | Biofuels are a current, scalable and inexpensive solution

Another key message is that these fuels are a real and viable solution that can already be implemented today. It is a solution that also requires little investment in new infrastructure, because vehicle engines are already compatible and biofuels can be purchased at existing petrol stations. The Italian company Eni, for example, states on its website that biofuels 'can be used in transport to partially or entirely replace traditional fossil fuels'.

Biofuels have already contributed to reducing greenhouse gas emissions in the European Union, according to an analysis by the European Environment Agency: specifically, by 5.6% between 2010 and 2022 (and by 4% if we take into account emissions generated by land use changes). In fact, they currently contribute more than electricity in the transport sector, both at European and national level.



However, transport is the only sector that has continued to increase its overall emissions in Europe over the last decade, and the use of biofuels is still very marginal. It has stabilised at around 6.5% since 2020, according to data collected by Eurostat up to 2022. Increasing this figure is a challenge limited by the complicated scalability of the sector, according to the aforementioned report by the European Court of Auditors: 'Sustainability issues, biomass availability and costs are limiting the deployment of biofuels'. According to the Corporación de Reservas Estratégicas de Productos Petrolíferos (CORES, for its acronym in Spanish), the public body that guarantees security of energy supply in Spain, 57 million litres of oil were consumed in the country in 2023, while 'the largest [biofuel] projects in Spain [...] estimate up to 3,850,000 tonnes of biofuel production per year', according to a report by Ecodes. Crossing the two figures, state supply would account for only 7% of demand. CORES notes that biofuels accounted for 3.65% of petrol and 7.99% of diesel consumed in 2024, with the most recent data.



José Ramón Galán-Mascarós, ICREA researcher at ICIQ, points to the difficulty of making the technology economically viable, especially compared to petrol and diesel, which have historically been supported by large infrastructures and financially backed by public and private bodies. In the case of biofuels, 'when you start scaling up technologies you have a problem, because the public funds say that this has to be done by private funds, and the private funds say they don't see clearly whether they will lose money or not', he concludes.

TotalEnergies' press office tells Verificat that access to raw materials (plants, waste, sugar, etc.) remains a barrier to growth. Shell refers to its internal statistics, which show that demand in the passenger road sector is still very low.

Techno-optimistic narratives

Many posts on social media echo scientific findings that manage to produce fuels from promising new substances such as algae, coconut shells, olive pits or coffee, for example, and present them as an immediately scalable option that solves the mobility problem. It is a misleading idea because, although the process has been shown to be technically possible, mass production is not yet a real option.

The eternal promise that technology will solve the climate crisis is known as techno-optimism. This is a disinformation technique included in a 'new denialism' called climate retardism which, as we explained in Verificat, accepts the existence of climate

change and the human cause behind it, but hinders and delays effective measures to address it. Messages on social media, for example, ignore the fact that a scientific discovery does not immediately translate into a project that can be scaled up internationally.

For this reason, some of the experts interviewed by Verificat argue that the alternatives that are sometimes proposed, rather than real options, are procrastination tools that can 'sell the illusion that certain products will be on the market', says Jordi Guilera, researcher at IREC, but 'the time horizon is so long and so many changes are required, that what is being done is to gain time', he adds.

Mario Giampietro, former ICREA researcher at ICTA-UAB and specialist in the economics of food systems, who has devoted part of his career to studying the potential of biofuels, also refers to the scientific myths surrounding them. For him, the big problem in the debate on biofuels is that it is 'a political myth', because 'they are neither feasible nor viable in relation to the objective of providing society with a large-scale net supply of this type of fuel'.

EXPLAINER | The false dichotomy between electrification and biofuels

X (formerly Twitter) is full of posts presenting biofuels as the alternative that the EU should opt for in order to decarbonise European mobility, to the detriment of electric vehicles. Indeed, many of these messages are accompanied by misinformation narratives about electric vehicles such as that they burn more or pollute more than fossil fuels, both widely debunked by the European fact-checking community. This idea is not explicitly stated on oil companies' websites, but rather is an inference made by users on social media based on the sustainability they attribute to biofuels.

In other words, what the messages in X are posing is a false dichotomy between the electrification of mobility and the use of biofuels, i.e. a scenario in which only one of the two approaches can prevail. In reality, both the EU and the experts consulted by Verificat advocate an energy mix in which biofuels —together with synthetic fuels and other

alternatives— help to reduce emissions in sectors that are difficult to decarbonise, such as aviation, maritime transport and freight transport, while the fleet of cars and vans is being electrified.

Some of the companies analysed even explain that their commitment is not exclusive and that biofuels will be mainly focused on transport that cannot be electrified. Shell, in its strategy report for the energy transition for 2024, states that it expects rapid growth in electric vehicles and believes that 'biofuels and natural gas will also play a role in reducing emissions from heavy-duty transport'.

In fact, researchers are calling for a further shift in European initiatives, not only to promote electric mobility, but also to reduce the vehicle fleet. If every family goes from having one combustion engine car to two or three electric cars, 'everything we gain in efficiency we lose in volume,' argued Olga Alcaraz, a member of the Institute for Research in Science and Technology for Sustainability (CITES) at the Polytechnic University of Catalonia (UPC), in an interview with Verificat in 2024.

The Intergovernmental Panel on Climate Change (IPCC), the field's maximum authority, points in a 2022 report that electric vehicles using low carbon electricity (i.e., solar, wind or nuclear), is the technology with the highest potential to reduce transport emissions. Nevertheless, the group also vows for systemic changes, as adapting cities to a better connectivity, invest in public transportation, cycle lanes and walkable zones, or promoting telework and shared mobility. The report mentions biofuels for road transport as a "mitigation" strategy for the short and middle term.

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