

Optimal pathways to consistent biomethane and bioethanol supply in Europe

KEY FINDINGS

Biomethane and bioethanol production capacities are anchored in **climate neutrality objectives and renewable energy targets**. EU policies, targets, and strategies define the overall direction of travel, while national implementation largely determines the pace and scale of deployment. **Production outcomes differ** across Member States, with **Italy, France, Denmark and Germany** accounting for a substantial share of EU output. The UK, operating under a separate regulatory framework, shows comparable production patterns in line with EU average in which sustained policy signals underpin bioenergy deployment.

Biomethane production has entered a phase of **sustained growth**, driven by upgrading biogas and grid injection, but expected volumes remain below the 2030 target. **Bioethanol** production, by contrast, is relatively **stable**, while demand continues to rise under transport blending obligations, resulting in increasing reliance on imports. Advanced bioethanol remains marginal but strategically relevant for future transport fuel supply.

Sectoral dynamics show bioethanol primarily serving road **transport**, while biomethane contributes to decarbonisation across gas networks, **industrial energy use**, and **heating**. **Agriculture** plays a central role in both value chains as a feedstock provider.

Success factors and obstacles are predominantly regulatory. Uptake accelerates where legal frameworks provide **clarity, predictability** and **operational simplicity**. Conversely, fragmented rules, delayed transposition and heterogeneous technical and sustainability requirements, together with feedstock price volatility remain the main constraints, outweighing limitations related to technology maturity or resource availability.

[Biomethane](#) and [bioethanol](#) are part of Europe's effort to replace imported fossil fuels, decarbonise hard-to-electrify sectors, and strengthen energy security. While renewable energy (RE) is expanding, 2023 Eurostat¹ data shows that the EU energy system remains dominated by fossil fuels. Bioenergy, which is [largely home-grown](#), accounts for around 60% of RE consumption. Within this landscape, biogas (e.g. biomethane) and liquid biofuels (e.g. bioethanol) have earned increasing relevance. This briefing aims to **define optimal pathways² for the uptake of biomethane and bioethanol in Europe**. In order to enable a comprehensive understanding on the topic, the next section provides technical definitions and explanations of the two fuels.



Technical Background

Biomethane and bioethanol are both renewable fuels produced from biomass. However, they differ in how they are obtained, the feedstocks they require and in terms of the infrastructure that they use.

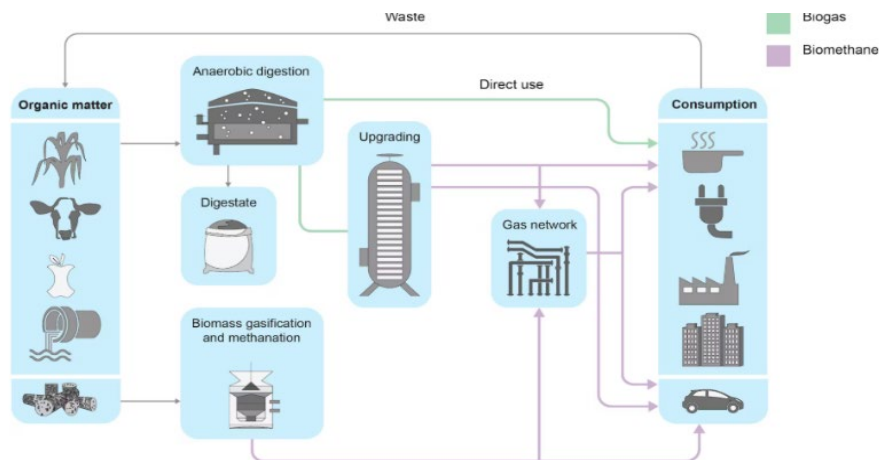
Biomethane

Biomethane is a **renewable gas** produced by upgrading biogas³ (a raw gas containing 50–70% methane and 30–50% CO₂) into a gas with a methane content above 95%, that is similar in energy content and quality to fossil natural gas. Thanks to this achieved equivalence, biomethane can be injected into existing gas grids and used in natural-gas applications⁴. There are two main distinct production pathways⁵:

- **Upgrading biogas:** Organic matter is digested to produce biogas, which is then purified, obtaining biomethane. Figure 1 shows this when the path starts on anaerobic digestion. This is the dominant technology in Europe.
- **Thermal gasification followed by methanation:** Biomass is converted into a synthesis gas. After cleaning and “methanation”⁶, this is upgraded into biomethane. Figure 1 shows this when the path starts by methanation.

Typical end-uses of biomethane⁷: **Heating** (residential, commercial, district heating), **Industry** (process heat), **Power generation** (flexible dispatchable electricity production).

Figure 1: Biomethane production pathways.



Source: [IEA Outlook for Biogas and Biomethane](#)

Bioethanol

Bioethanol is a liquid fuel produced via fermentation, where microorganisms convert sugars into ethanol. There is “first-generation” bioethanol and “second-generation” (advanced) bioethanol.

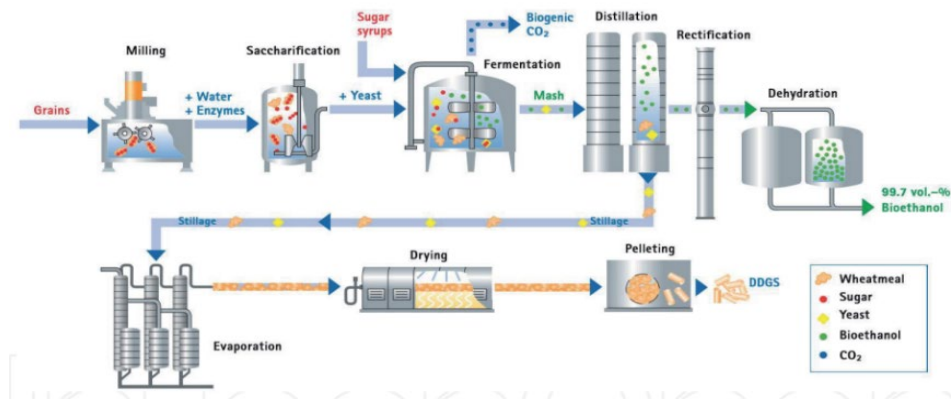
The two main production pathways are:

1. **“First-generation” bioethanol:** sugars/starches extracted from crops such as wheat, maize or sugar beet and fermented. As visible in Figure 2.
2. **“Second-generation” (advanced) bioethanol:** uses lignocellulosic biomass (straw, corn stover, forestry residues). Process includes a necessary pretreatment phase, followed by hydrolysis,

fermentation, and distillation. 2G pathways have higher costs (low technological maturity) and lower yields, facing challenges for uptake.

Typical end-uses of bioethanol⁸: **transport**: blended with petrol (E5, E10⁹, E85), or as a base for renewable aviation components. **Industry and chemicals**: used to produce solvents, plastics, and chemical intermediates, and **energy**: combusted for heat and power (less common in the EU).

Figure 2: 1st generation Bioethanol production process

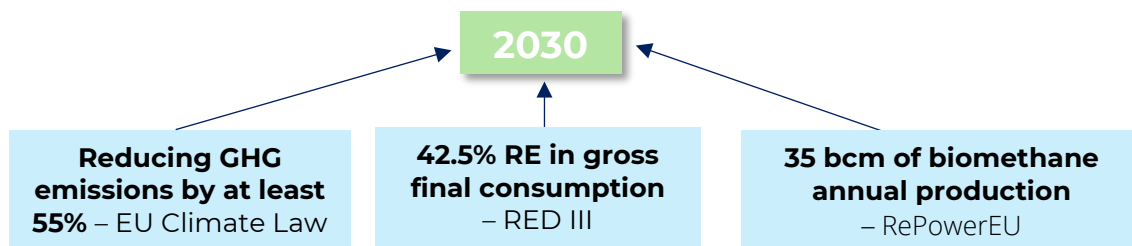


Source: [Yun, Yongseung. \(2020\). Alcohol Fuels: Current Status and Future Direction. 10.5772/intechopen.89788.](https://doi.org/10.5772/intechopen.89788)

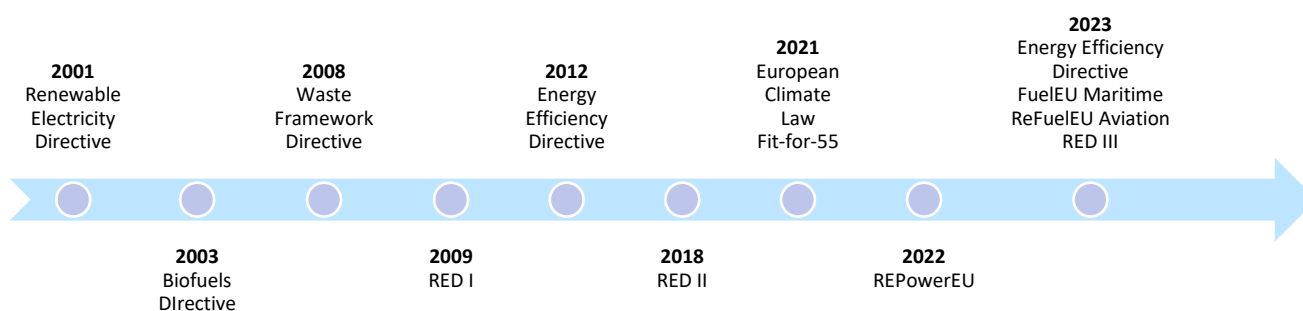
Targets and Policy Framework

EU-27

The EU's climate and energy framework provides the main direction and regulations for the development of biomethane and bioethanol. Three main headline targets^{10 11} **shape supply and demand for both**: i) a minimum 55% cut in GHG emissions by 2030 and achieving climate neutrality by 2050; ii) reaching at least 42.5% RE in gross final energy consumption by 2030 (indicative 45% objective); and delivering 35 billion cubic metres (bcm) of biomethane annually by 2030.



The regulatory architecture has evolved over the last two decades in two directions: **early directives** (until RED II) focused on **promoting renewable electricity and biofuels**, while **recent** ones emphasise **sustainability, efficiency and strategic energy security**. The timeline below shows the main relevant legislative and policy developments for biomethane and bioethanol at EU level.



Since 2021, the **Fit-for-55** package has been updating energy and climate laws covering electricity, transport, industry and buildings. The **REPowerEU Plan** (although not legally-binding) links renewable deployment with energy-security priorities and includes a specific target for biomethane. Sustainability rules under **RED II** and **RED III** restrict crop-based biofuels and require minimum GHG savings, which pushes for the advancement and incorporation of advanced bioethanol. Waste and agricultural legislation, including the **Waste Framework Directive** and the **Common Agricultural Policy (CAP)**, influence which feedstocks are available, under what conditions, and how they compete with material uses. These instruments affect both demand (through **targets and fuel mandates**) and supply (through **sustainability criteria and crop-based caps**). The table below offers a summary of the main targets and implications of key elements of the regulatory framework. These are further elaborated in Annex A.

In addition to renewable energy and fuel mandates, broader EU pricing and regulatory instruments shape the economic incentives for biomethane and bioethanol production. The **EU Emissions Trading System (ETS)** assigns a cost to carbon emissions, increasing the relative competitiveness of low-carbon fuels. The **Landfill Directive** increases the availability and economic value of waste and residue feedstocks, and the **EU Taxonomy for Sustainable Activities** provides a classification system that channels investment towards activities meeting defined climate and sustainability criteria. These three influence the prices in energy and carbon markets, as well as the prioritisation of feedstocks and pathways to deliver environmental benefits.

Table 1: EU Policy and Regulatory Framework

Element of the framework	Headline Scope/ Target	Implications for Biomethane	Implications for Bioethanol
European Climate Law	55% GHG cut by 2030 and climate neutrality by 2050	Biomethane is recognised as a way to cut emissions in heat, industry and transport.	Biomethane is recognised as a way to cut emissions in transport.
RED II (2018) and III (2023)	42.5% RE by 2030. REDII: 7% cap on crop-based biofuels; minimum 3.5% advanced fuels of energy used in transport by 2030.	Biomethane as renewable energy (RED II). RED III raises ambition and boosts uptake.	Crop-based capped, advanced ethanol contributes to the 3.5% advanced fuels in transport target.
REPowerEU	Strategic, non-binding plan to cut fossil imports. Biomethane target: 35bcm/year by 2030.	Biomethane target established for 2030.	Accelerates overall renewables and gives priority to advanced feedstocks.
Fit-for-55	Package aligning EU laws to the 2030 target.	Brings targets + standards that increase integration and create demand in maritime, heating and industry.	Tightens transport decarbonisation: raises RE shares and sector mandates (aviation, maritime).

Element of the framework	Headline Scope/ Target	Implications for Biomethane	Implications for Bioethanol
Waste Framework Directive	Waste hierarchy and separate bio-waste collection.	Separately collected bio-waste and residues lead to sustainable feedstock.	Expands advanced feedstocks for 2 nd gen ethanol.
FuelEU Maritime	GHG intensity of ship energy: -2% (2025) à -80% (2050);	Creates demand for renewable marine fuels.	Residual use as maritime rules favour renewable gas and e-fuels.
ReFuelEU Aviation	SAF mandate: 2% (2025) à 70% (2050); synthetic share: 0.7% (2030) à 35% (2050).	No primary role in jet fuel.	Role limited to Advanced Bioethanol.
ETS	Carbon pricing mechanism covering power, industry and (from 2027) buildings and road transport fuels.	Improves the relative competitiveness of biomethane and strengthens demand to replace fossil gas.	Improves the competitiveness of low-GHG transport fuels, supporting demand for bioethanol blend.
Landfill Directive	Limits landfilling of biodegradable municipal waste and requires progressive diversion from landfill.	Supports feedstock mobilisation by incentivising anaerobic digestion, reducing methane emissions from landfills.	Indirect effect by increasing availability of feedstocks for 2 nd gen bioethanol pathways.
EU Taxonomy	Classification system defining environmentally sustainable economic activities for investment and finance.	Framework to prioritise biomethane projects meeting sustainability criteria, facilitating access to finance.	Influences investment toward advanced bioethanol pathways, while increasing scrutiny on 1 st gen ethanol.

At a glance: Member States (MS) transposition and implementation

Across the EU, **uneven transposition has resulted in varied implementation**. By mid-2024, many Member States had not fully transposed¹² RED II, and compliance with RED III deadlines¹³ was even more limited. Transport-related provisions have generally progressed faster, reflecting longer-standing blending mandates, whereas renewable gas provisions lag behind. Infrastructure constraints further amplify these differences. Until recently, the absence of EU-level rules on gas grid access left biomethane injection largely to national discretion, resulting in significant disparities. Around 9% of EU biomethane plants remain without grid connection, with bottlenecks particularly visible in parts of Northern and Eastern Europe. The European Grids Package¹⁴ establishes common principles for network planning and access and is expected to reduce these structural gaps over time. In contrast, bioethanol regulations are generally more mature across Member States, as national mandates are primarily driven by RED transport provisions¹⁵ that have been in place for over a decade. Annex B includes a table with MS transposition and targets of relevant directives.

From targets to production: frontrunners in biomethane and bioethanol uptake

Denmark, Italy, France and Germany consistently emerge as **frontrunners** in the transposition and implementation of EU biomethane and bioethanol legislation, combining timely regulatory action with clear national targets and delivery mechanisms. Italy and Denmark stand out for their early and comprehensive transposition of RED II and RED III, complemented by national frameworks that go beyond minimum EU requirements. Denmark was the only Member State to notify [RED III transposition](#) by the May 2025 deadline, with Italy following shortly thereafter.

In biomethane, Germany, Denmark and Italy [lead](#) EU production, supported by long-standing agricultural integration, established biogas sectors and strong coordination between energy, waste and agricultural policies. Italy has set the highest national biomethane target at 5.7 bcm per year, followed by France at 4.15 bcm, both far above the EU average. Denmark, despite a lower absolute target, aims for a fully green gas system by 2030 and has achieved near-universal grid connection of biomethane plants. In bioethanol, France is a clear leader, combining high [blending mandates](#) with a robust domestic production base. Petrol blending obligations reach over 10%, supported by stable national implementation of RED transport rules.

Several Member States, including Poland, Greece and parts of Eastern Europe, **lag behind in both policy implementation and market development**, largely due to delayed transposition and slower institutional adaptation. By 2024, Poland and Greece were still operating under outdated renewable energy frameworks, with Greece among the few countries continuing to apply sustainability criteria derived from RED I. Both countries also underperformed on advanced biofuel targets and struggled to meet crop-based biofuel caps.

National legislation driving implementation: the Italian biomethane decrees

Biomethane production in Italy has increased steadily over the past years. The turning point came with the [2018 Biomethane Decree](#), adopted in a context of slow uptake despite a large biogas availability. The decree was designed to unlock latent potential by offering a clear route biogas to biomethane, particularly for transport use. It [introduced](#) a dedicated incentive scheme, combined with guaranteed access to the gas grid and simplified administrative procedures. Building on the success of these measures, the [2022 Biomethane Decree](#) further reinforced the framework. As part of Italy's Recovery and Resilience Plan, it successfully scaled volumes in line with EU targets and broadened biomethane use beyond transport. This was done by a decree expanding eligibility to new plants and conversions, [introducing](#) investment grants alongside operating support, and standardising permitting and contractual arrangements.

The impact is visible as **biomethane production has risen** year-on-year since 2018 (from 0.8 to over 7bcm), placing Italy among the [leading producers](#) in the EU, having set [national target](#) of 5.7 bcm of annual production by 2030. A key lesson to be learned from this case is that it is **highly replicable** as the key is regulatory clarity, long-term visibility and administrative simplification.

United Kingdom (UK)

The United Kingdom's regulation for biomethane and bioethanol is based on the country's net zero framework¹⁶. This is anchored in the [2008 Climate Change Act](#), which established a **legally binding target** to achieve **net-zero greenhouse gas emissions by 2050**. Achieving this target is based on five-year carbon budgets that guide the pathway to net-zero, the development of which is supported by, the UK's Climate Change Committee¹⁷. Within this framework, a number of schemes are regulating and supporting bioethanol and biomethane.

For **biomethane**, the Renewable Heat Incentive (RHI) was the UK’s scheme for renewable heat. The non-domestic RHI opened on 2011 and closed to new applicants on 2021, while the domestic RHI closed on 2022. Biomethane support then transitioned to the [Green Gas Support Scheme \(GGSS\)](#), which provides tariff-based incentives for grid injection to new biomethane plants. It is funded by the Green Gas Levy and Renewable Gas Guarantees of Origin (RGGOs) ensure sustainability compliance. As of 2025, this scheme includes 129 producers. For **bioethanol**, the [Renewable Transport Fuel Obligation \(RTFO\)](#) requires fuel suppliers to blend a minimum proportion of renewable fuels (incl. bioethanol). This is verified through the Renewable Transport Fuel Certificates (RTFCs) and increases yearly (2025: 12.15%) up to 14.6% by 2032.

Current and expected production

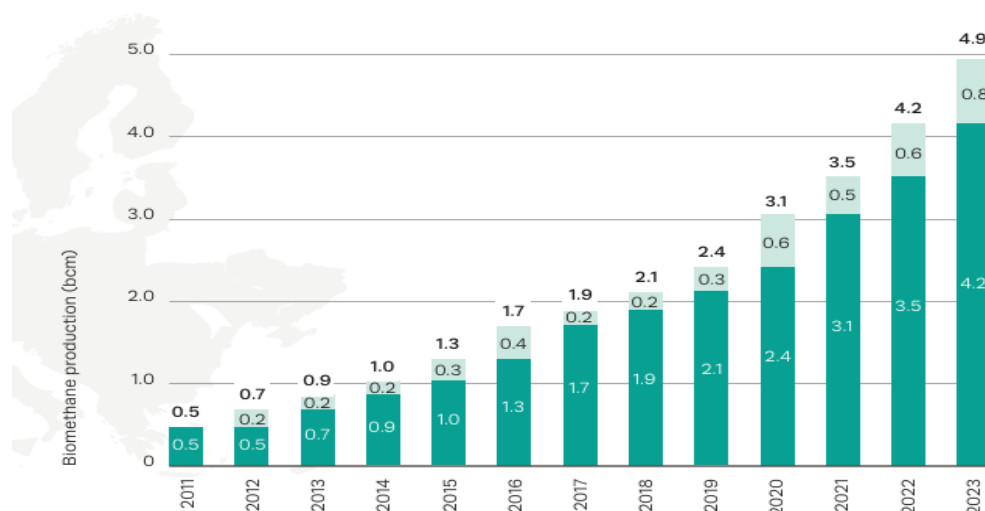
This section oversees current and expected productions of biomethane and bioethanol at the EU level, and specific insights into main MS producers and the UK.

Biomethane outlook

EU-27

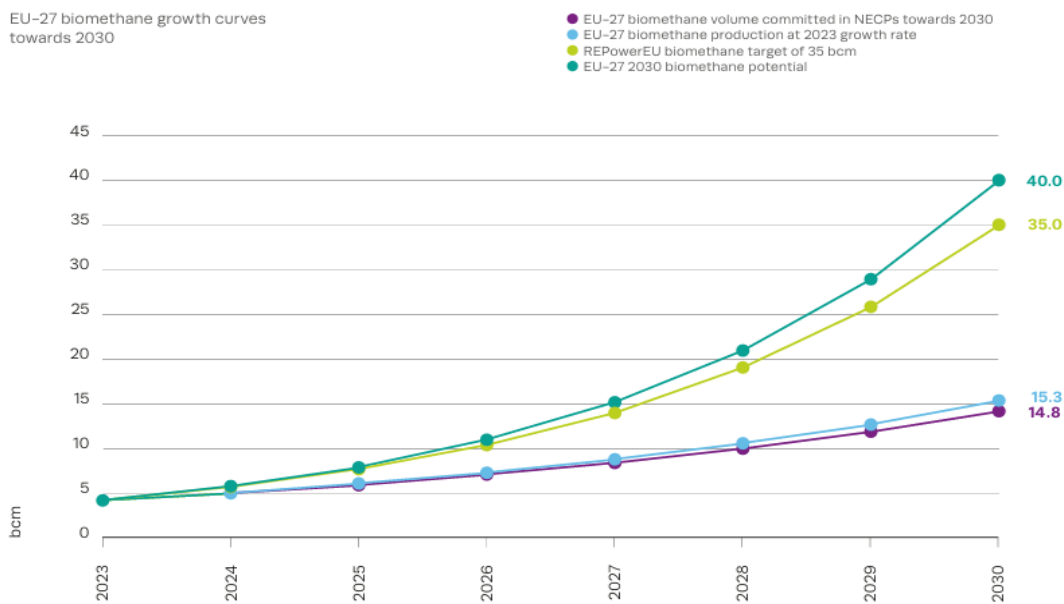
While biogas production is widespread across the EU, the conversion of biogas into grid-injected biomethane remains uneven, reflecting additional regulatory, technical, and infrastructure requirements beyond biogas generation alone. Still, production at EU level is **increasing steadily**. The most recent available consolidated EU-wide data from EBA¹⁸ show that in 2023 combined biogas and biomethane production¹⁹ reached 22 bcm, equivalent to around 7% of EU natural gas consumption and exceeding the total gas demand of Belgium, Denmark and Ireland combined. Biomethane alone reached 4.9 bcm (Figure 3), with installed capacity rising to 6.4 bcm/year by early 2024, marking the strongest annual increase observed to date.

Figure 3: Biomethane production in the EU 27 (Light green shows new production).



Source: [EBA Statistical Report 2024](#).

Figure 4: EU-27 Biomethane growth scenarios by 2030.



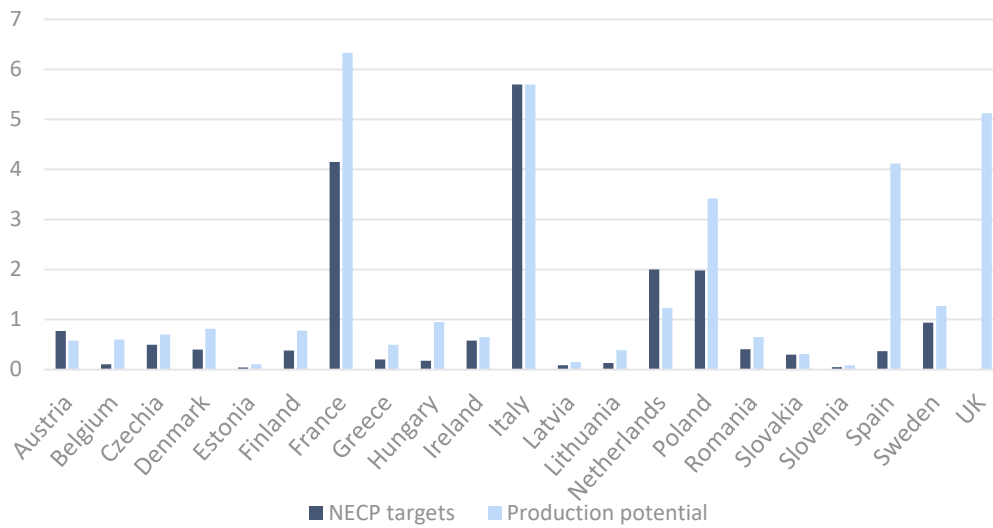
Source: [EBA Statistical Report 2024](#)

Forward-looking assessments from EBA report (Figure 4) nonetheless reveal a persistent gap between production and targets and reveal production potentials^{20 21}. While current growth rates are broadly aligned with MS commitments under updated NECPs, meeting the indicative REPowerEU target of 35 bcm of biomethane by 2030, leaving a shortfall on present trajectories. This is particularly relevant in a supply-demand context: natural gas remains highly import-dependent, with around 290 bcm of the EU’s 330 bcm gas consumption imported. On the other hand, biomethane is mainly produced within the EU.

Member States

France, Germany, Italy, and Denmark are the main EU biomethane producers¹⁹, accounting for over 66% of total EU production in 2023. Moreover, in 2023, France and Denmark were already producing more biomethane than biogas and lead EU biomethane growth rates. In terms of plant numbers, France and Germany together host almost twice as many biomethane plants as all other EU countries combined. Denmark hosts some of the largest plants. Potential production of biomethane can be assessed based on installed production capacity.

Figure 5: EU MS NECP target vs Biomethane Production Potential (in bcm) + UK



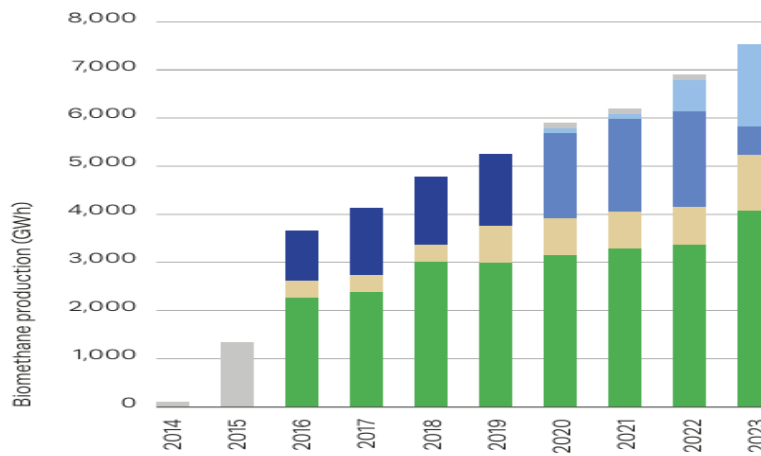
Source: Own elaboration based on [EBA](#) data and [SGN](#)

Figure 5 compares per-country NECP targets (either pre-2024 or the updated version) with their production potential²¹ proving a high correlation between target and potential. However, the fact that targets are less than half of the estimated potential could significantly limit realised production. **Germany, France, and Italy** are expected to be the top producers by 2030. The graph also includes the UK for further reference, although NECP target do not apply in this case.

United Kingdom

There are 120 biomethane plants²² in the UK – most of which have been developed in the last 10 years – which produced 0.75 (7.5 TWh) of biomethane in 2023¹⁹. Based on the **stark increase of biomethane production** (Figure 6) in the last 10 years and continued policy support (GGSS), an increase in plants and production can be expected. In fact, RTFO, GGSS and RHI, are expected to support around 8 TWh of biomethane injections by 2030, while the UK Biomass Strategy estimates that 30-40 TWh (3-4 bcm) of biomethane production in 2050 would help the UK achieve net zero cost-effectively²³.

Figure 6: UK Biomethane production (GWh) by type of feedstock.



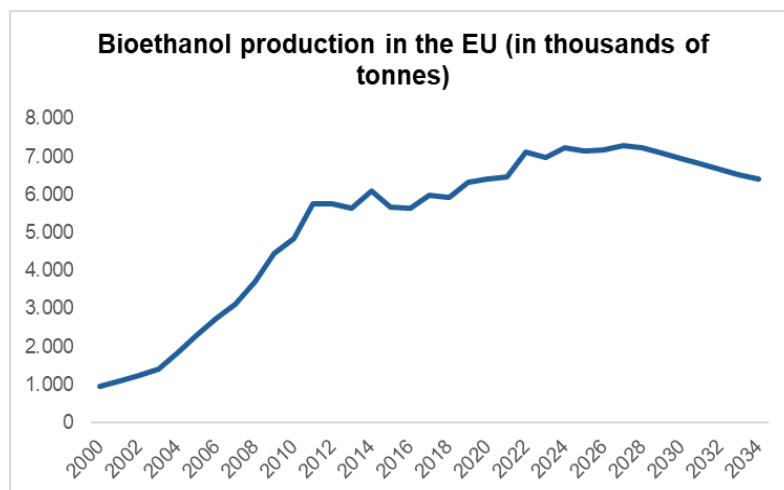
Source: [EBA Statistical Report 2024](#)

Bioethanol Outlook

EU-27

Bioethanol production in the EU has grown significantly since the early 2000s (Figure 7), but became quite stable from the mid-2010s onwards²⁴. Recent data from ePure²⁵ show moderate fluctuations rather than sustained expansion, reflecting²⁶ market maturity and constraints linked to feedstock availability and limits to crop-based biofuels. While technology and supply chains are well established, growth in 1st generation ethanol has been limited by regulatory [caps and concerns](#) over food-fuel trade-offs.

Figure 7: EU Bioethanol Production Trend.

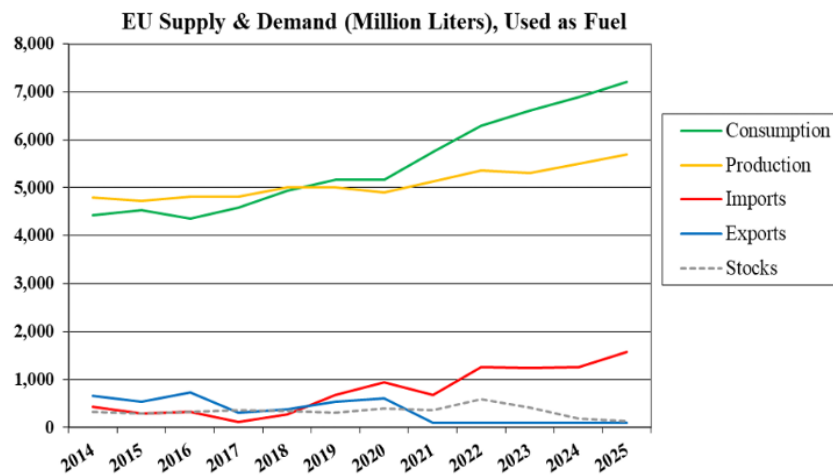


Source: Own Elaboration based on [OECD data](#).

The supply-demand balance²⁴ has shifted decisively. Until 2018, the EU was a net exporter of bioethanol (Figure 8). Since then, consumption has outpaced domestic production, making the EU a net importer. Consumption has continued to rise in line with transport blending mandates, while production has not

increased at the same rate. This divergence creates a structural supply gap that is increasingly filled by imports (Pakistan, US, Brazil).

Figure 8: EU Supply and Demand of Bioethanol.



Source: [USDA Biofuels Annual Report 2025](#)

Upscaling and uptaking Bioethanol: a French biorefinery in action

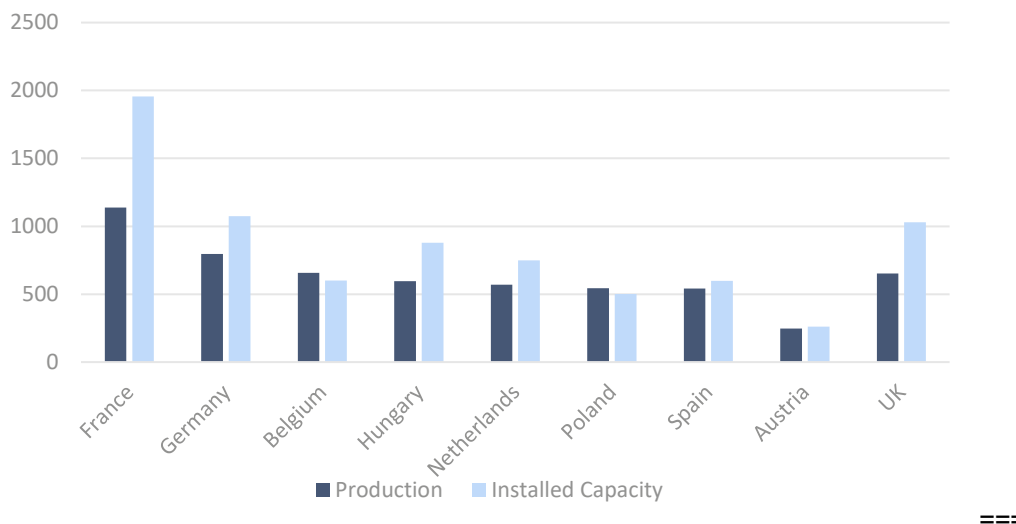
[CAVALE](#) is a French cooperative winery distillery that operates as a **circular bio-refinery**. The distillery collects grape marc and wine lees and valorises all fractions, producing advanced bioethanol while [methanising distillery residues](#) to generate biogas for heat/electricity and returning compost to vineyards.

Beyond site-level integration, CAVALE aligns with, and leverages, the strengths of France's wider **bioethanol** ecosystem, which provides proven mobility benefits and local economic gains. Nationally, [Superethanol-E85](#) (60-85% bioethanol) reduces CO₂ emissions and fine particles compared with fossil petrol, while lower pump prices accelerate consumer and fleet adoption. The sector's local traceability (grapes, beets, cereals, and sugar/starch residues), full biomass valorisation, and direct/indirect jobs created reinforce how integrated sites like CAVALE can plug into national demand and policy frameworks. As grapes are part of the EU's [Annex IX](#) classification, the ethanol produced is considered Advanced Bioethanol. CAVALE illustrates a replicable, policy-consistent pathway.

Member States (MS)

France and Germany are the largest consumers and producers²⁴ of 1st generation bioethanol in Europe. While France successfully matches rising consumption with strong national production, Germany faces the largest bioethanol deficit in the EU. **Central and Eastern European countries** (such as Poland) have increased production, benefiting from high corn availability, favourable economic conditions, and the adoption of E10. In contrast, Mediterranean countries such as Italy are growing more slowly because E10 has not been fully implemented. Furthermore, 2nd generation bioethanol is limited across the EU due to high commercialisation risks. Figure 9 shows European top producers and the UK.

Figure 9: Bioethanol top producers vs installed capacity per MS (in million litres) + UK

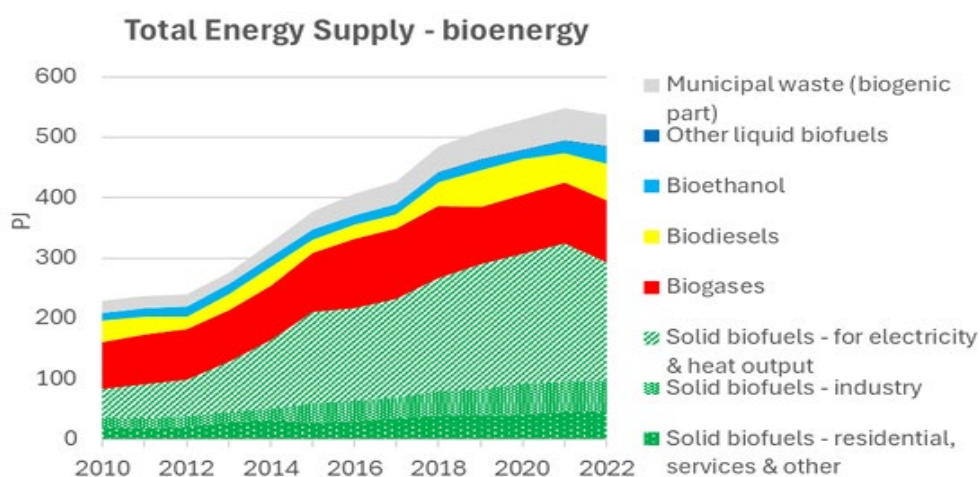


Source: Own elaboration based on [USDA](#), [ePURE](#) and [OECD](#) available data for top EU producers

United Kingdom (UK)

After rapid growth in the 2000s, most bioenergy pathways have stabilised in recent years (Figure 10), although **liquid biofuels have resumed expansion** since 2018. Bioethanol production has increased in the UK²⁷, being one of the main users of bioenergy. In 2024, renewable fuels supplied under the UK’s RTFO made up 8% of all road and non-road transport fuel²³, with bioethanol accounting for 39% of verified renewable fuel, whereby most bioethanol feedstock was corn (45%). In 2025, RTFO provisional data indicate around 7% of renewable fuels²⁸, of which ethanol takes up around 47%.

Figure 10: Bioenergy supply in the UK



Source: [IEA Bioenergy UK country fiche](#).

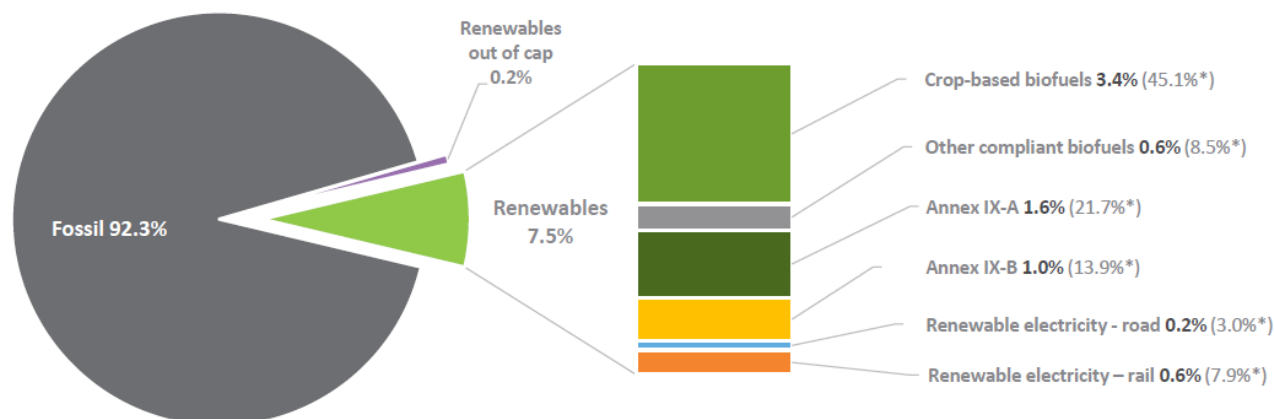
Specific sectors at a glance

This section provides a closer look at particularly relevant sectors for biomethane and bioethanol. Namely, transport, energy (for heating and industrial energy use), and agriculture.

Transport

Transport remains the largest [final energy consumer](#) in the EU. Fossil fuels continue to dominate the energy mix²⁷, with diesel representing 67% of transport energy consumption in 2023 and gasoline accounting for a further 25.3%. Although biofuels are expected to play a significant part on decarbonisation (RED II establishes a target of 14% while RED III rose this to 29%), Figure 11 shows the small role played now (7.5% of the energy mix). **Bioethanol** is mostly relevant for transport, where it is used mainly for gasoline blending (E5/E10). **Biomethane**, remains a niche option²⁹ with limited vehicle stock and infrastructure compared with liquid fuels.

Figure 11: Energy Mix composition for transport 2023



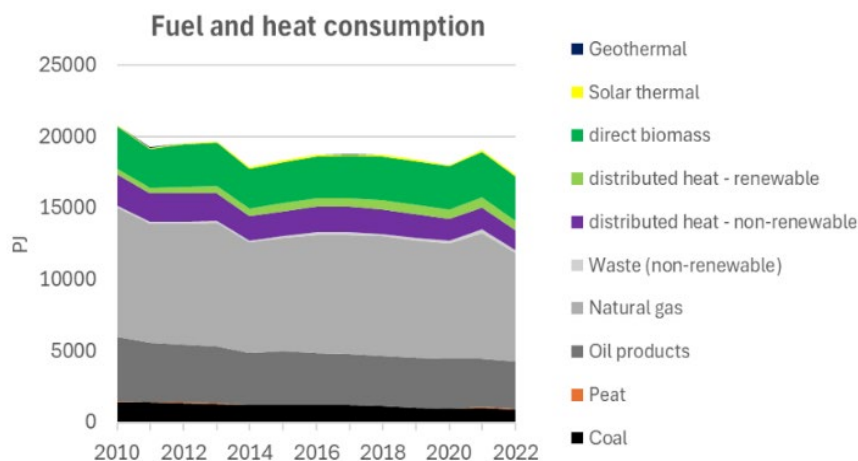
Source: ePURE (2025) based on public data from [Eurostat SHARES](#).

Key EU transport regulation includes the 2003 [Biofuels Directive](#), the [Energy Taxation Directive](#), the [RED I](#) and the [Fuel Quality Directive](#). [RED II](#) and [RED III](#) set the direction of travel to 2030. Sectoral initiatives such as [FuelEU Maritime](#) and [ReFuelEU Aviation](#) create new long-term demand for advanced fuels. The recent EU decision to delay the planned 2035 ban on new combustion engines implies the extension of the medium-term demand for liquid transport fuels. This adjustment is likely to sustain market relevance for bioethanol as a renewable petrol substitute and maintain investment incentives for ethanol.

Heat and Industrial Energy Use

Reliance on fossil fuels³⁰ for heat and industrial energy use is still significant. In 2022 (latest data³¹ available), almost 70% of fuel consumption for heat originated from fossil energy. Also in 2022, biomass was the **dominant renewable heat source**, accounting for 18% of heat supply. Figure 12 illustrates a large dominance of natural gas and a stable contribution of bioenergy. Industrial energy use displays a similar pattern. In 2022, one third of final sector's energy consumption was met by electricity, with fuels covering the remaining two-thirds. Overall, renewables represent around 25% of industrial final energy²⁷ use, combining renewable electricity (13%), bioenergy carriers (10%), and renewable district heat (2%).

Figure 12: Fuel consumption for heat in the EU.



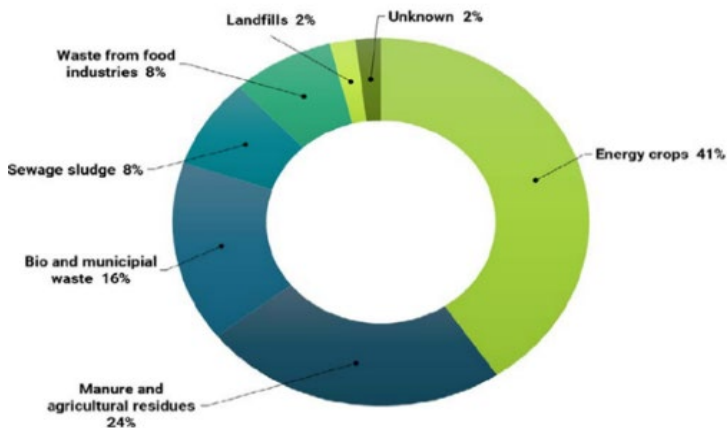
Source: [IEA Implementation of bioenergy in the European Union – 2024 update](#) based on [World Energy Balances](#).

The policy environment governing heat and industrial energy use is shaped by multiple frameworks. The [Renewable Energy Directives](#) provide the overarching targets, culminating in RED III's binding 42.5% renewable share by 2030. The [Energy Efficiency Directive](#) and [Energy Performance of Buildings Directive](#) reinforce demand reduction and renovation obligations, while the [Effort Sharing Regulation](#) drives national-level emission reductions for building heat.

Agriculture

Agriculture plays a dual role³²: it is both an **energy consumer and the primary source of feedstocks**. This linkage has become increasingly regulated as EU legislation tightened sustainability criteria, set limits on crop-based feedstocks and expanded the role of wastes and residues. [RED II](#) introduced strict limits on food- and feed-based biofuels, [RED III](#) further raises the ambition for advanced biofuels³³ to 5.5% by 2030. These provisions influence farm-level decisions: cereal and sugar crops remain important for **bioethanol production**, but the regulatory trajectory favours manure digestion, straw mobilisation and on-farm anaerobic digestion. As regards, **biomethane production**, energy crops remain the first source, closely followed by manure and agricultural residues. Ongoing discussions around [RENURE](#) criteria are also relevant, as clearer recognition of digestate as a fertiliser substitute could improve nutrient recycling and the overall economics of biomethane projects. Figure 13 and 14 show the main feedstocks used to produce biomethane and bioethanol.

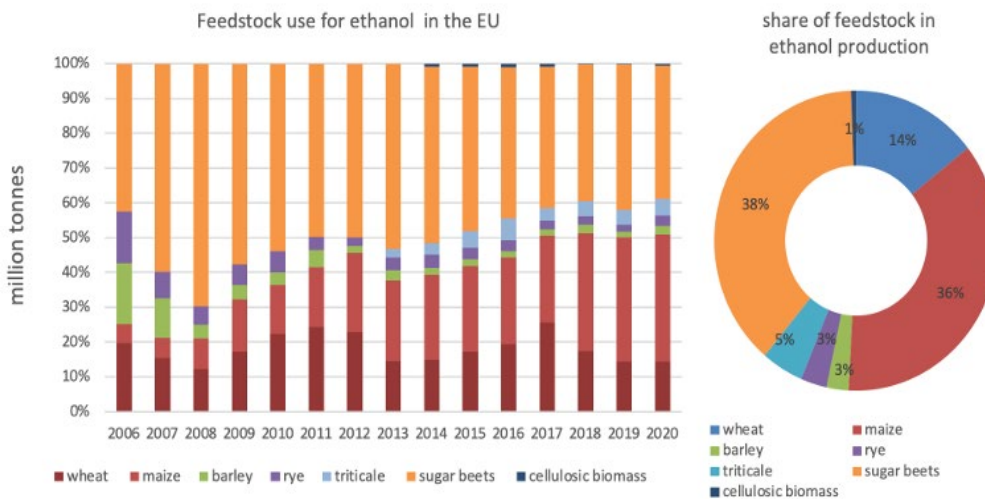
Figure 13: Feedstock use share for biomethane production



Source: [Van Gelder et al. 2025](#).

Agriculture accounts for 2-3% of final energy consumption³⁴ in the EU, with fossil fuels providing over 90% of direct farm energy³². Electrification of machinery and deployment of on-farm renewables remain limited but increasing, whereas **biomethane production has become a noteworthy agricultural contribution to decarbonisation**. The agricultural sector can help improve sustainable biomethane availability²⁷ in Europe.

Figure 14: Feedstock use share for bioethanol production



Source: [IEA 2023 Newsletter](#)

Success factors and obstacles for uptake

The below list is elaborated based on a detailed revision of academic and grey literature and interviews with key stakeholders. A long list of drivers and barriers is presented in Annex C.

Table 2: Key Success Factors and Barriers for Uptake.

Category	Key Takeaways
Policy and Regulatory	Binding targets and firm mandates are the strongest uptake enhancers. Permitting speed, proper administrative competences, coordination between admin units and grid rules are decisive. Delayed transposition weakens market confidence and limits integration.
Economic and Market	Biomethane benefits from multiple revenues (e.g. digestate, Biogenic CO ₂), while bioethanol relies on mature fuel and co-product (e.g. animal feeds) markets. Feedstock price volatility is the dominant economic risk in both sectors.
Technical, Resources and Infrastructures	Biomethane and 1 st gen bioethanol technologies are mature. System integration (and having the support of natural gas companies), not technology readiness, is the main constraint. Grid access (biomethane) and low tech readiness for 2 nd gen bioethanol slow uptake.
Socio-economic and Governance	Local value creation and circular benefits support acceptance, especially for biomethane. Governance fragmentation delays projects and increases administrative burden. 1 st gen bioethanol continues to face public and political sensitivity around potential food-fuel trade-offs.

Policy and regulatory factors

For biomethane, binding targets³⁵ and long-term visibility³⁶ are consistently identified as **decisive success factors** because they convert EU-level ambition into demand signals and production increases. Evidence from countries such as Denmark, France and Italy shows that simple permitting systems⁷ and streamlined grid-connection⁵ procedures significantly reduce development timelines and transaction costs, directly affecting project viability. Guarantees of origin²² further enhance market confidence. Conversely, fragmented sustainability certification⁷, delayed transposition of RED III criteria and heterogeneous gas-quality standards³⁷ remain major barriers. The absence of a single market for biomethane is also mentioned as a key barrier by industry associations. Limited administrative capacity and weak coordination between authorities emerge as the most persistent regulatory barriers.

For bioethanol, policy success factors are primarily linked to firm transport blending mandates⁸. These, together with emerging quotas³⁶, provide **predictable demand and underpin long-term uptake** agreements. However, crop-based caps²⁶ are widely cited as regulatory barriers. These are formed by three interrelated elements: the existence of a quantitative cap itself, the definition of what qualifies as “crop-based” fuel, and uncertainty linked to potential future revisions of sustainability rules.

Economic and market factors

In biomethane markets, multiple revenue streams are a central success factor. Unlike other biofuels, biomethane production delivers a bundle of outputs – renewable gas, digestate, and increasingly recoverable biogenic CO₂ – creating additional value streams and strengthening its integration into circular economy models. The emergence of biomethane hubs⁵ (where feedstock aggregation, upgrading and grid access are coordinated) further reduces unit costs and improves economies of scale. At the same time, feedstock cost volatility and logistics⁷ are structural barriers. The pace of biomethane integration also

depends on the engagement of gas network operators and suppliers, as their investment decisions, grid-management practices and offtake strategies shape market access.

Bioethanol benefits from mature agricultural value chains, established co-product markets and existing plant capacity²⁶, which together support competitiveness and operational stability. However, feedstock price volatility and competition²⁴ with food, feed and export markets remain significant barriers.

Technical, resource and infrastructure factors

For **biomethane**, commercially mature and scalable technologies³⁸ mean that technical readiness is rarely the binding constraint. The key barriers instead relate to low feedstock accessibility³⁹. Although feedstock volumes are high in aggregate, they are dispersed, requiring aggregation infrastructure and coordinated logistics. Grid access constraints⁷ further limit effective injection capacity despite technical feasibility. A specific and increasingly relevant constraint relates to limited reverse-flow capabilities in gas networks, particularly in rural areas. During periods of low demand, local low-pressure grids often lack the capacity to transport surplus upstream to high-pressure transmission networks.

1st generation **bioethanol** similarly benefits from proven technologies and retrofittable existing plants²⁶, which facilitate incremental upgrades. 2nd generation pathways offer strong greenhouse gas performance by unlocking waste and residue streams. However, high capital expenditure, complex pretreatment requirements and insufficient residue collection systems⁴⁰ remain major barriers for its uptake.

Socio-economic and governance factors

For **biomethane**, local value creation, rural job generation, nutrient recycling and methane-emission reduction are important success factors³⁸ that enhance social acceptance. However, governance fragmentation⁷ remains a significant barrier. Overlapping competencies and unclear responsibility for feedstock allocation contribute to permitting delays and slow project execution. In some MS, local opposition linked to siting, transport and environmental perceptions continues to slow project development.

1st generation **bioethanol** faces fewer local governance issues but is constrained⁸ by concerns of potential food-fuel trade-off, land-use change, and indirect land-use change. These refer to potential expanded crop demand that may displace food production or trigger land conversion elsewhere. 2nd generation bioethanol has not reached a point at which production is affected by social concerns.

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- ¹ See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview#Final_energy_consumption.
- ² A "pathway" is defined as: possible ways in which the production and use of biomethane and bioethanol could evolve over time, given available technologies, policies, markets and sustainability constraints.
- ³ See: <https://www.iea.org/reports/outlook-for-biogas-and-biomethane-prospects-for-organic-growth/an-introduction-to-biogas-and-biomethane>.
- ⁴ See: <https://www.gie.eu/wp-content/uploads/filr/12060/USINGG1.PDF>.
- ⁵ See: https://theblunomy.com/static/84825af94dfaf3ba6248d2b834a9f7b8/blunomy_biomethane_briefs.pdf.
- ⁶ Methanation is a chemical reaction that converts CO_x to methane through hydrogenation. More info: <https://www.sciencedirect.com/topics/engineering/methanation>.
- ⁷ See: <https://www.rabobank.com/knowledge/d011498995-europes-biomethane-landscape-between-ambition-and-reality>.
- ⁸ See: <https://www.epure.org/wp-content/uploads/2023/02/230227-DEF-REP-Overview-of-biofuels-policies-and-markets-across-the-EU-February-2023-1.pdf>.
- ⁹ E5 petrol contains up to 5% of renewable ethanol, while E10 contains up to 10%, which helps reduce emissions associated with road transport. It is not mandated in EU legislation but it is in some MS national rules. E85 has up to 85%.
- ¹⁰ See: https://climate.ec.europa.eu/eu-action/climate-strategies-targets/2030-climate-targets_en.
- ¹¹ See: https://climate.ec.europa.eu/eu-action/european-climate-law_en#:~:text=Based%20on%20a%20comprehensive%20impact,compared%20to%20levels%20in%201990.
- ¹² See: <https://www.epure.org/wp-content/uploads/2024/06/240618-DEF-REP-Overview-Report-June-2024.pdf>.
- ¹³ See: https://energy.ec.europa.eu/news/commission-takes-action-ensure-complete-and-timely-transposition-eu-directives-key-decisions-energy-2025-07-24_en.
- ¹⁴ See: https://energy.ec.europa.eu/publications/communication-european-grids-package-com2025-1005-final_en.
- ¹⁵ See: <https://www.epure.org/about-ethanol/fuel-market/overview-of-biofuels-obligations-in-the-eu/>.
- ¹⁶ See: <https://www.gov.uk/government/publications/net-zero-research-and-innovation-framework>.
- ¹⁷ See: <https://www.theccc.org.uk/>.
- ¹⁸ The [European Biogas Association](#) (EBA) publishes an annual [Statistical Report](#) that provides an extensive examination of the biogases industry across Europe, elaborating original data collected from the EU-27 and several additional European countries, that are not on Eurostat/public data.
- ¹⁹ See: <https://www.europeanbiogas.eu/publication/eba-statistical-report-2024/>.
- ²⁰ Potential estimates assume full collection and mobilisation of available feedstocks for energy use, excluding competing material uses and practical constraints related to logistics, sustainability and local acceptance.
- ²¹ See: <https://guidehouse.com/-/media/new-library/services/sustainability/documents/2024/biogases-towards-2040-and-beyond.ashx>.
- ²² See: <https://www.europeanbiogas.eu/publication/european-biomethane-map-2025/>.
- ²³ See: <https://www.gov.uk/government/publications/desnz-annual-report-and-accounts-2024-to-2025/performance-report>.
- ²⁴ See: https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Biofuels+Annual_The+Hague_European+Union_E42025-0004.pdf.
- ²⁵ See: <https://www.epure.org/wp-content/uploads/2024/06/240618-DEF-REP-Overview-Report-June-2024.pdf>.
- ²⁶ See: https://www.unido.org/sites/default/files/files/2022-08/UNIDO_Ethanol_Summary_Report_screen.pdf.
- ²⁷ See: https://www.ieabioenergy.com/wp-content/uploads/2024/12/CountryReport2024_UK_final.pdf.
- ²⁸ See: <https://www.gov.uk/government/statistical-data-sets/renewable-fuel-statistics-data-tables#section>.
- ²⁹ See: <https://www.epure.org/wp-content/uploads/2024/06/240618-DEF-REP-Overview-Report-June-2024.pdf>.
- ³⁰ See: https://www.ieabioenergy.com/wp-content/uploads/2025/01/CountryReport2024_EU27_final_v2.pdf.
- ³¹ See: <https://ec.europa.eu/eurostat/databrowser/view/ten00124/default/table?lang=enç>.
- ³² See: https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/07/oecd-fao-agricultural-outlook-2025-2034_3eb15914/601276cd-en.pdf.
- ³³ See: https://knowledge4policy.ec.europa.eu/glossary-item/advanced-biofuels_en.
- ³⁴ See: <https://ec.europa.eu/eurostat/databrowser/view/ten00124/default/table?lang=enç>.
- ³⁵ See: <https://www.europeanbiogas.eu/wp-content/uploads/2025/06/EBA-Roadmap-towards-2040-09.05.25-1.pdf>.
- ³⁶ See: <https://www.ieabioenergy.com/wp-content/uploads/2023/09/IEA-BioenergyT39-Biofuel-News-62-final.pdf>.
- ³⁷ See: <https://profundo.nl/projects/biogas-policies-in-the-eu-a-policy-and-financial-analysis/>.
- ³⁸ See: Antonio Carlos Franco, Luciane Silva Franco, Daniel Poletto Tesser, Rodrigo Salvador, Cassiano Moro Piekarski, Claudia Tania Picinin & Fabio Neves Puglieri (2021): [Benefits and barriers for the production and use of biomethane](#), Energy Sources, Part A: Recovery, Utilization, and Environmental Effects.
- ³⁹ See: <https://iea.blob.core.windows.net/assets/5b757571-c8d0-464f-baad-bc30ec5ff46e/OutlookforBiogasandBiomethane.pdf>.
- ⁴⁰ See: <https://www.sciencedirect.com/science/article/pii/S1364032113005716>.

Annex A. Long list of relevant legislation

Component	Description, relevance and key targets
RED II/III	Central EU framework for renewable energy. Sets binding EU-wide renewable energy targets (for 2030 , at least 42.5% with an indicative 45% target) and specific transport sub-targets for renewable fuels, including biofuels and certain renewable gaseous fuels. Defines sustainability and GHG-saving criteria that biomethane and bioethanol must meet to count towards national targets and support schemes, and allows renewable gases injected into the gas grid to be counted in both energy and transport sectors under defined conditions.
REPowerEU	Strategic plan to reduce dependence on imported fossil fuels and accelerate the energy transition. Includes a dedicated 35 billion cubic meters (bcm) per year sustainable biomethane production goal by 2030 and calls for accelerated deployment of biogas and biomethane through investment support, simplified permitting and better use of waste/feedstock potentials.
Net-Zero Industry Act	Part of the EU's industrial policy to support manufacturing and deployment of net-zero technologies in Europe. Improves the investment climate for bioenergy supply chains, biorefineries and gas-upgrading technologies by facilitating permitting for "net-zero" projects and improving access to finance and support schemes for strategic value chains.
Fit-for-55 package	Legislative package implementing the EU's at least -55% GHG reduction target for 2030 . Shapes long-term demand for low-carbon fuels, including renewable gases and biofuels, by tightening sectoral targets and strengthening carbon-pricing signals, which can improve the relative competitiveness of biomethane and advanced bioethanol.
Energy Efficiency Directive	EU framework for energy savings, setting an EU-level target for final and primary energy consumption by 2030 and requiring Member States to contribute via national measures. Indirectly influences the market size for all fuels, including biomethane and bioethanol, and strengthens the expectation that fuel-switching should be combined with efficiency improvements rather than replace them.
Waste Framework Directive	Sets principles for waste prevention, reuse, recycling and recovery , including conditions for use of bio-waste and sewage sludge. Encourages the use of organic waste streams for energy recovery where material use is not feasible, thereby supporting the mobilisation of sustainable feedstocks for biogas and biomethane and reinforcing the link between circular-economy objectives and renewable gas production
EU Grids Package	The package establishes EU-level principles for gas network planning, connection, access and tariff design , with a stronger focus on accommodating increasing shares of biomethane and other renewable and low-carbon gases. It seeks to reduce fragmentation in grid-connection rules, improve transparency on available capacity, and promote anticipatory investment where justified by decarbonisation objectives. For biomethane, this improves conditions for grid injection and market integration, by addressing local bottlenecks and one-way flow constraints in distribution networks.
Biofuels for transport and transport related RED provisions	The transport chapter of the RED, together with fuel-quality rules, defines how biofuels can be used and counted in transport, including sub-targets for advanced biofuels and caps on certain crop-based fuels. These provisions set minimum shares of renewable energy in transport energy use by 2030 and influence the balance between first-generation and advanced bioethanol, as well as the potential use of biomethane as a transport fuel.
FuelEU Maritime and ReFuelEU Aviation	Sectoral regulations requiring increasing shares of renewable and low-carbon fuels in maritime and aviation, with specific greenhouse-gas intensity reduction trajectories over time. They open additional markets for advanced biofuels and e-fuels and can create indirect demand for bioethanol-based components and for biomethane-derived fuels in hard-to-electrify transport segments.
CAP	EU agricultural policy, implemented through strategic plans, influencing land use, crop choices and rural development funding. Certain measures can support feedstock production and logistics for biogas and bioethanol (e.g. support for manure management, on-farm anaerobic digestion or residue mobilisation), while sustainability requirements and conditionality may limit the use of dedicated energy crops.

Annex B. Member State implementation, targets, and production fiches

Please note that the tables below present some gaps, this due to lack of data/transposition of relevant directives.

Biomethane

Country	Legal basis
Austria	<p>Green electricity Act (2003)</p> <p>Renewable Power Act (2012) – indirect support for biomethane</p> <p>Austrian Regulation on Transport Fuels (2012)</p> <p>Renewables Expansion Act (2021) – shift towards biomethane production</p> <p>Implementation Regulation on the Market Premium Model for Renewable Power (2022)</p> <p>Revision of the Transportation Fuels Regulation (January 2023) –in accordance with RED</p> <p>Green Gas Act draft (2023) – green gas quota for gas suppliers</p> <p>Guarantee of Origin System – Art. 19 of REDII</p>
Belgium	<p>National Green Certificate Scheme (2001) – 1 certificate per 1 MWh of renewable electricity produced</p> <p>System of ‘Labels de Garantie d’Origine’ (LGOs) – enable the CHPs to receive support via the ‘certificats verts’ system</p> <p>Extension of the GO registry system (2019) – comply with art. 19 RED II</p> <p>‘Plan Wallon Energie Climat’ – 2030 objectives on biogas development</p>
Bulgaria	
Croatia	FiT scheme (2016) – for electricity from biogas
Cyprus	
Czechia	<p>Act on the Promotion of Renewable Energy Sources (2022 and amended on 2023) – to accelerate deployment of renewable energy</p> <p>Czech Republic’s National Energy and Climate Plan – biomethane target</p> <p>The Czech Republic’s scheme (2023) – support the construction and operation of new or converted sustainable biomethane production plants</p> <p>Rural Areas Development Programme – help farmers undertake projects that diversify their economic activities</p>
Denmark	<p>Subsidies for biogas since 1990s</p> <p>National biomethane registry (2011) – certificates fulfil the criteria outlined in the REDII as Guarantees of Origin (GOs).</p> <p>Energy agreement (2018) – in line with Paris Agreement</p> <p>NECP target – 100% renewable energy supply by 2050.</p> <p>New CO2 taxation on industry is expected to be introduced in 2025</p>
Estonia	<p>Energy Act (1998) – support for renewable energy</p> <p>Ministry of Rural Affairs introduced investment aid for the valorisation of bioresources (August 2022)</p> <p>Premium scheme by Ministry of Economic Affairs and Transport (2017) – bridge gap in price between natural gas and biomethane</p> <p>New investment grant for biomethane production (2024) – financial support for biomethane production units</p>
Finland	<p>Renewable heat and power tariff system – based on competition</p> <p>Investment support – available for the construction of all renewable energy production facilities</p> <p>Finnish energy and climate strategies – promote biogas for use as a transport fuel in particular</p> <p>Finland’s national biogas action plan (January 2020) – expectation of continued production growth</p>

Country	Legal basis
France	<p>Renewable Energy Feed-in Tariffs (FiTs) (2001) - subsidising its biogas sector. Revising the support system in 2002, 2006, 2011, 2016 and 2020</p> <p>French Act on Energy Transition for Green Growth (LTECV) (2015) - fully committed France to the transition to a renewable energy system</p> <p>The Long-Term Energy Schedule (PPE) - injection target of 7% to 10% biomethane by 2030</p> <p>The 'right to inject' (2019)</p> <p>Biogas Production Certificates (2022) - intended to require the production of grid-injected biomethane</p> <p>"Taxe Incitative Relative à l'Utilisation d'Énergies Renouvelables dans le Transport," (TIRUERT) (2023) - aligns taxation to reduced carbon emissions</p> <p>Biomethane Purchased Agreement (2024) - between producers and industrial consumers</p>
Germany	<p>Electricity Feed-In Act (1991) - subsidy for renewable electricity production</p> <p>Renewable Energy Sources Act (2000) - tripled biogas production by 2002. Updates in 2004, 2009, 2012, 2014 and 2017.</p> <p>EEG-2017 - tendering system to move towards a more market-driven electricity production</p> <p>EEG-2023 - new maize cap thresholds</p> <p>NECP (2024) - target of 8.4 GW in electric capacity from biomass by 2030</p> <p>Gas Grid Access Ordinance (GasNZV) - grid connection requirements</p> <p>Federal Pollution Control Act - support for biomethane in transport</p>
Greece	<p>3851 Renewable Energy Law</p> <p>FiTs (2010) - into the Renewable Energy Law for landfill-based and agriculture-based biogas plants</p> <p>FiTs (2016) - new feed-in tariff prices</p> <p>first law mentioning biomethane for injection in the gas distribution network (2023) - complete legal framework is due by the end of 2024</p> <p>NECP target - 2.1 TWh/year by 2030 and 9.7 TWh/year by 2050</p>
Hungary	<p>Electricity Act (2001) - pivotal feed-in tariff (FIT) for electricity generation from biogas</p> <p>The renewable electricity support scheme METÁR (2017) - replaced the feed-in tariff with a feed-in premium system (FiP)</p> <p>The National Strategy for Energy for 2030 with outlook for 2040 (2020) - replace 1% of their natural gas consumption by 2030</p>
Ireland	<p>Renewable Energy Feed-in Tariff (REFIT) (2005) - encouraged growth in the Irish biogas sector up to 2010</p> <p>REFIT update (2011) - differentiate between plants with and without CHP</p> <p>Support Scheme for Renewable Heat (SSRH) (2019) - operational support</p> <p>Renewable Electricity Support Scheme (2020) - operates as a Contracts for Difference (CfD) support scheme</p> <p>Microgeneration Support Scheme (MSS) (2021) - allowed consumers who own a small-scale electricity installation to sell their excess energy back to the grid</p> <p>2021 Climate Action Plan - biomethane production target of 1.6 TWh per year for injection by 2030</p> <p>2023 Climate Action Plan - target of 5.7 TWh, 10% of national gas demand, to come from biomethane by 2030</p> <p>2024 Climate Action Plan - 5.7 TWh per year by 2030 and 1 TWh of biomethane by 2025</p> <p>National Biomethane Strategy (2024) - first major policy initiative on biomethane</p> <p>The Irish Renewable Transport Fuels Obligation (RTFO) scheme - boosts biomethane in transport sector</p> <p>Renewable Heat Obligation (RHO) - proposed introduction by the end of 2024</p>

Country	Legal basis
Italy	green certificate system (1999) – first official subsidy ‘tariffa omnicomprensiva’ (2008) – all-inclusive feed-in tariff (FiT) for small renewable energy plants Decree of 02 March 2018 – to incentivise the production of biomethane The Italian Biomethane Decree (2022) – boosted biomethane production ‘Sblocca Motori’ (or ‘Engine Unlocking’) Decree – encouraged existing agricultural plants to increase the amount of electricity they produce from biogas Biogas Done Right guidelines – framework for sustainable farming NECP target – 5.7 bcm by 2030 The Decree of the Ministry of the Environment and Energy Security of 12 March 2024, no. 99) – new support system for biogas plants FER2 Decree (DM 19/06/2024) – incentives for innovative renewable energy plants
Latvia	Comprehensive oversight mechanism – any violations of rules by biogas producers can lead to a reduction in payments from the feed-in tariff of over 15%. Several draft versions of biomethane legislation have been circulating among stakeholders in Latvia
Lithuania	Ministry of Energy plan – at least 950 GWh of biomethane by 2030 National Climate Change Programme (2021) – €15 million to eight biomethane production plants or biogas upgrading facilities. Lithuania’s National Energy Independence Strategy action plan – support for the production of biomethane from agricultural waste and other non-communal waste
Luxemburg	
Malta	
Netherlands	Green Funds green certificate scheme (1995) – support for renewable energy “Environmental Quality of Electricity Production” feed-in-premium (FiP) (2003) – significant growth of biogas sector “Stimulerend Duurzame Energie” (SDE) (2008) – renewable energy and CHP production support scheme The SDE scheme – facilitated a notable increase in biomethane production
Poland	Energy Law Act (2005) – start of biogas production Renewable Energy Act (2015) – replaced green certificate scheme Action scheme for newly built renewable energy projects (2015) Feed-in Tariff (FiT) and Feed-in Premium – supports use of biogas via CHP 2021-2027 Cohesion Policy – dedicated financial support system the ‘Biofuel Act’ and the ‘Act on Bio-components’ (2017-2021) – stimulate demand zero-excise tax for CNG, LNG, biomethane, biogas and hydrogen (2020) ‘Letter of intent to establish a partnership for the development of the biogas and biomethane sector and the conclusion of a sectoral agreement’ (2020) ‘Agreement on cooperation for the development of the biogas and biomethane sectors’ (2021) NECP target – 5.5 billion cubic meters (bcm) of biomethane could be produced by 2040 Ongoing amendment on ‘Act on Electromobility and Alternative Fuels’ – ims to implement and enhance the development of clean transport Draft act was produced by the Ministry of Agriculture and Rural Development and industry specialists for agricultural plants with an annual capacity of up to 82 GWh – to speed up investment process
Portugal	Limited Feed-in Tariff (FiT) (2014) – for electricity production and injection into the grid Portuguese state aid scheme (2023) – support the production of renewable hydrogen and biomethane Biomethane Action Strategy for 2024-2040 – target of 2.7 TWh Electronic auction for the centralised purchase of biomethane (2024) Ordinance No. 168/2024/1 – Support scheme to promote renewable hydrogen and other renewable gases
Romania	“green” certificate system (2010) – development of biogas sector Draft Energy Strategy (2024) – 5% by 2030 and 10% by 2050 of biomethane

Country	Legal basis
Slovakia	Act 309/2009 Coll. – support scheme which promotes renewable energy sources and high-efficiency cogeneration Slovakia’s Recovery and Resilience Plan – scheme to support plants' modernisation (2022) and conversion of existing ones (2023)
Slovenia	"Public Engagement Framework" (2023) – to involve local communities and stakeholders in discussions regarding energy use and renewable energy development NECP target
Spain	‘General Electricity Law 54/1997’ – first support for renewable energy: Feed-in Tariff (FiT) and premium Recovery, Transformation and Resilience Plan (2022) – incentive pro- grammes for biogas installations The Spanish biogas roadmap (2022) – GOs, reduction of administrative barriers and circular economy boost Legal basis for a system of guarantees of origin for renewable gases (2022) NECP target – increase biogas and biomethane production to 20 TWh by 2030 Recovery, Transformation and Resilience Plan (2024) – public consultation on the regulatory framework for calls to support biogas and biomethane installation projects Order TED/728/2024 – Biomethane and renewable gases can now be counted towards the transport targets for renewable fuels Public consultation (2024) – concerning the transposition of Directive (EU) 2024/1788
Sweden	Taxation framework for Energy, Carbon Dioxide and Sulphur (1991) – indirect support for biogas Swedish climate law – ambitious overall national GHG emission targets for 2030 and 2045 Swedish Biogas Market Review – production goal of 10 TWh of biomethane by 2030 Long-term production support scheme (2022) – for biomethane and LBG Revaq for Wastewater Treatment plants and Certifierad Återvinning for other plants – current certification schemes for digestate

Country	Draft NECP biomethane target	Production (plants)	2030 potential (Gas for Climate) (bcm)
Austria	No biomethane target, only biogas	16	0,58
Belgium	0.11	15	0,6
Bulgaria	No target mentioned		0,69
Croatia	No biomethane target, only biogas		0,21
Cyprus	No biomethane target, only biogas		0.04
Czechia	0.5	13	0,7
Denmark	0.4	58	0,82
Estonia	0.04	8	0,11
Finland	No biomethane target, only biogas	29	0,78
France	4.15	760	6,33
Germany	No target mentioned	260	7,63
Greece	0.2		0,5
Hungary	0,18	2	0,95
Ireland	0.58	4	0,65
Italy	5.7	137	5,7
Latvia	No target mentioned	8	0,15
Lithuania	0.13	5	0,39
Luxemburg	No biomethane target, only biogas	3	0.03
Malta	No target mentioned		0.01
Netherlands	2	87	1,23
Poland	No target mentioned		3,42
Portugal	No target mentioned	5	0,65
Romania	0,41		2,04
Slovakia	0.3	2	0,31
Slovenia	0.05		0,09
Spain	No biomethane target, only biogas	15	4,12
Sweden	No target mentioned	63	1,27

Bioethanol

Country	Legal basis
Austria	Fuel Ordinance 2012, Version of 2 January 2024 – transposing all RED II provisions.
Belgium	<ul style="list-style-type: none"> • Royal Decree of 16 July 2014 updated on 13 February 2018 – feedstocks that can be double-counted • Royal Decree of 4 May 2018 updated on 31 December 2021 and 27 December 2022 – blending obligations: 10.2% • Royal Decree of 17 December 2021 – transposing RED II • Royal Decree of 27 December 2022 – blending obligation to 10.2% • Law of 16 December 2022 – palm and soy and derivatives prohibited • Law of 31 July 2023 – New blending obligations from 2024; transposing Articles 6, 20, 21, 25, 26 and 27 of RED II
Bulgaria	<p>Bulgaria has not fully transposed RED II into national law (as of 2024)</p> <p>Renewable Energy Law (updated on 22 December 2023) – advanced biofuels target Integrated Plan in the Field of Energy and Climate the Republic of Bulgaria (updated 2024)</p> <p>Ordinance on sustainability criteria for biofuels, liquid biomass fuels and gaseous and solid biomass fuels (amended on 26 March 2024)</p>
Croatia	<p>Croatia has started but not completed the transposition of RED II into national law (as of 2024)</p> <p>Act on biofuels for transport, in force on 22 May 2021 – transposing RED II Art. 25, 26, 27, and 29.</p> <p>Regulation on the special fee for the environment for not placing biofuels on the market, adopted on 5 November 2010 and last updated December 2023 – penalties for blending mandate</p>
Cyprus	<p>Cyprus’s transposition of RED II into national law is ongoing (as of 2024)</p> <p>Law 106/2022 The Fuel Emissions Standards, Sustainability Criteria and Reduction Act of 2022 – transposing most RED II provisions.</p> <p>Law 107/2022 on The Promotion and Encouragement of the Use of Renewable Energy Sources Law of 2022 – overall ambition for use of renewables by 2030.</p>
Czechia	<p>The Czech Republic’s transposition of RED II is ongoing (as of 2024)</p> <p>Government Regulation No. 189/2018 – sustainability criteria for biofuels and reduction of GHG emissions from fuels.</p> <p>Government Regulation No. 107/2022 – amending Government Regulation No. 189/2018.</p> <p>Act No. 201/2012 (version 2024) – renewable mandate in transport.</p>
Denmark	<p>Danish Energy Agreement 2018 – share of renewables in its gross final consumption of energy by 2030.</p> <p>Decree on CO2 e-displacement requirements and sustainability, etc. (26 May 2023) – GHG emissions reduction target and additional RED II elements.</p> <p>Promulgation of the Act on Sustainable Biofuels and on the Reduction of Greenhouse Gases (Biofuels Act) (29 November 2021) – transposing some RED II elements.</p>
Estonia	<p>Estonia started the process of transposing RED II into national law (as of 2024)</p> <p>The Act on Amendments to the Law on the Organization of Energy Management and Amendments to Related Laws (Adopted on 4 May 2022) – transposing various RED II transport provisions.</p> <p>Liquid Fuel Law (revision entered into force on 1 January 2024) – transposing the RED II crop cap and biofuel blending obligation.</p> <p>Regulation for Environmental requirements for liquid fuels, sustainability criteria for biofuels, liquid biofuels and biomass fuels (revision entered into force on 16 July 2023) – transposing the RED II’s Art. 29 GHG reduction targets.</p> <p>Atmospheric Air Protection Act (revision in force from 1 July 2023).</p>
Finland	<p>Finland transposed all transport related provisions of RED II</p> <p>13.4.2007/446 Act on promoting the use of biofuels in traffic (as amended) – transposing RED II.</p> <p>7.6.2013/393 Act on biofuels, bioliquids and biomass fuels as amended on 28 December 2023 – transposing RED II Art. 29 GHG reduction targets</p>

Country	Legal basis
France	<p>Energy Code – Art. L281-1 to L281-5 & Art. L641-6 – transposing RED II blending targets and sustainability targets.</p> <p>Customs code – Art. 266 – biofuels blending obligations and specific caps (latest amendment: 29 December 2023).</p> <p>Decree No. 2019-570 of June 2019 – tax incentives for incorporation of biofuels (latest amendment: 29 December 2023).</p> <p>Code on taxes on goods and services – Art. L312-79 – tax rates for biofuels.</p>
Germany	<p>38th ordinance for the implementation of the Federal Emission Control Act – transposing Directive 2015/652 (last amendment: 17 July 2023).</p> <p>Regulation to determine further provisions for the further development of the greenhouse gas reduction quota (November 2021).</p> <p>Biofuel Sustainability Ordinance – Biokraft-NachV of 2021 – transposing the RED II art. 29 GHG reduction targets.</p> <p>Law to protect against harmful environmental effects caused by air pollution, noise, vibrations and similar processes as amended in 2021 (Federal Emission Control Act – BImSchG).</p>
Greece	<p>Greece is lagging behind with the transposition of RED II into national law (as of 2024)</p> <p>Law 4062/2012 – Official Gazette 70/A/22-3-2012 – transposing RED I.</p> <p>Law 3054/2002 and its amendments: producers and distributors of petrol and diesel must blend their fuels with a certain "quota" of biofuels.</p>
Hungary	<p>Law XLIV of 2020 – climate protection.</p> <p>Law CXVII of 2010 – use of renewable energy for transport purposes and reduction of GHG emissions from energy used in transport.</p> <p>Government Decree 821/2021 (XII 28) – sustainability requirements and verification of biofuels, liquid bio-energy carriers and fuels produced from biomass (last amendment in force: 1 Jan 2024).</p>
Ireland	<p>S.I. No. 350 of 2022 – European Union (Renewable Energy) Regulations (2) 2022 – setting RED II provisions for RES-T, the crop cap, Annex IX-A and IX-B biofuels, multipliers, and sustainability (last update in force since 1 January 2024).</p> <p>SI. No. 693 of 2023 – European Union (Renewable Energy) Regulations 2023 – increasing renewable fuel obligations from 1 January 2024.</p> <p>S.I. No. 43 of 2023 National Oil Reserves Agency Act 2007 (Biofuel Obligation buy-out-charge) – buy-out charge for biofuels at 0.05 euro per megajoule from 9 Feb 2023.</p> <p>S.I. No. 44 of 2023 National Oil Reserves Agency Act 2007 (Advanced Biofuel Obligation buy-out-charge) – buy-out charge for advanced biofuels at 0.08 euro per megajoule from 9 Feb 2023.</p> <p>S.I. No. 670 of 2020 European Union (Greenhouse gas emission reductions, Calculation methods and reporting Requirements) (Amendment) Regulations 2020 – extending the FQD target to the years after 2020.</p> <p>S.I. No. 142 of 2023 National Oil Reserves Agency (Minimum Percentage Volume of Renewable Transport Fuel in Petrol) Regulations 2023 – minimum 5.5% ethanol content in gasoline from 1 July 2023</p> <p>Ireland's Consultation Draft Renewable Transport Fuel Policy of March 2023 includes a discussion on the future use of a minimum percentage of ethanol in gasoline as a policy instrument to assist it in reaching climate targets.</p>
Italy	<p>Legislative Decree No.199 of 8 November 2021 (as amended) – transposing RED II.</p> <p>Decree of the Minister for Environment and Energy Transition No. 107 of 16 March 2023 – Updating the trajectory for renewable fuels targets in transport until 2030.</p>
Latvia	<p>Cabinet Regulation No. 332 of 2000 on the conformity assessment of petrol and diesel fuel, last amended in 2023</p> <p>Regulation of the Cabinet of Ministers No. 350 of June 14, 2022, suspended mandatory blending of biofuels for the period of July 1, 2022, through December 31, 2023</p> <p>Regulations of the Cabinet of Ministers No. 686 of November 2022 – RED II's Art. 29 sustainability provisions.</p> <p>Regulations 248 – NOR/2019 of Central Statistical Bureau "Procedure for Calculating the Proportion of Energy Produced from Renewable Energy Sources".</p> <p>A new Transport Energy Law is being drafted by the Government of Latvia (as of 2024)</p>

Country	Legal basis
Lithuania	2021 Law on Alternative Fuels of the Republic of Lithuania – transposing RED II provisions (latest version: July 2023). Renewable Resources Energy Law – transposing the sustainability provisions of the RED II Art. 29.
Luxembourg	Luxembourg is lagging behind with transposition of transport related provisions of RED II (as of 2024) Law of 17 December 2010 – penalties and tax incentives for biofuels. Grand-ducal regulation of 28 February 2017 modifying the grand-ducal regulation of 27 February 201: sustainability criteria for biofuels and bioliquids – setting the sustainability requirements of RED II Art. 29. Law of 29 August 2017 – targets for the GHG intensity reduction of fuels from 2020. Law of 20 December 2019 concerning the State revenue and expenditure budget for the financial year 2020 – crop cap and double counting for Annex IX-A biofuels. Environment Code (version of 12 September 2023) – compiling every applicable environmental legislation.
Malta	S.L. 545.35 (28 Dec. 2021) Promotion of Energy from Renewable Sources Regulations – transposing the main parts of the RED II. 545.37 (Dec. 28, 2021) Regulations on the criteria of sustainability of biofuels, bioliquids and fuels from biomass – sustainability provisions of the RED II.
Netherlands	The Netherlands formally transposed RED II by adopting two sets of implementation laws, the Decision Energy Transport and the Regulation Energy Transport, in late December 2021 Law on Environmental Management – chapter 9.7 transposition of RED. Chapter 9.8 transposition FQD. Decree energy transport (as amended on 20 March 2024) – biofuel blending obligations and Annex IX-A biofuel targets. Decision of 20 December 2021 amending the Energy Transport Decree with regard to the implementation of Directive (EU) 2018/2001 – transposing the RED II Art. 29 GHG reduction targets.
Poland	Poland has only partially transposed the RED II (as of 2024) Act on bio components and liquid fuels of 25 August 2026 (as amended) - crop cap Law on facilitating the preparation and implementation of investments in agricultural biogas plants and their operation of 8 May 2023 Law on Biocomponents and Liquid Biofuels
Portugal	On April 2023, the transposition of RED II was completed. Decree Law 8-2021 – transposing some provisions of RED II; applicable until the RED II is fully transposed. Decree Law 60-2020 – overall share of renewables in total energy consumption. Ordinance 301/2011 – penalty compensation for missing blending obligations. Decree-Law No. 84 of 9 December 2022 – goals related to the consumption of energy from renewable sources, partially transposing the RED II. Ordinance No. 135/2024/1 of 2 April 2024 - Regulates Decree-Law No. 84 of 9 December 2022, complementing the transposition of the RED II
Romania	Emergency Ordinance no. 163/2022 of 29 November 2022 - implementing various provisions of RED II Law 237/2023 regarding the integration of the hydrogen obtained from renewable sources and with low carbon emissions in the sectors of industry and transportation - rules for the fuel retailer on introduction of hydrogen in the transport sector and reporting on the energy content of all fuels starting with 2025. Fuel suppliers must ensure that the energy value from the volume of fuels from renewable sources of non-biological origin placed on the Romanian market and used in transport sector must equal at least five percent of the energy content of all fuels until 2030. The percentage is to grow gradually from 2025 (0.5 percent) to 2030 (five percent).

Country	Legal basis
Slovakia	<p>Slovakia finalized its transposition of RED II in January 2023</p> <p>Act 309/2009 on the support of renewable energy sources and highly efficient combined production and on the amendment and supplementation of certain laws – transposing the RED II provisions (last amended on 31 December 2023)</p> <p>Decree on renewable energy calculation of 2022 – implementing provisions of Act 309/2009 Amended in 2023</p> <p>Decree no. 271/2011 (last amended in 2023) – transposing additional RED II provisions</p> <p>An extensive amendment (no. 363/2022) to the Act on Support of Renewable Energy Sources and Highly Efficient Cogeneration, and on Amendments to Certain Acts No. 309/2009 Coll. that transposes the RED II to Slovakian national legislation entered into force on January 1, 2023. Updated the overall mandates for bioethanol and biodiesel and for the advanced biofuels and amendment also introduced mandates for Compressed Natural Gas (CNG) and Liquid Natural Gas (LNG).</p>
Slovenia	<p>Act on the Promotion of the Use of Renewable Energy Sources of July 2021 – transposing RED II.</p> <p>Regulation on renewable energy sources in transport of December 2021 – transposing RED II Art. 25, 26 & 27.</p> <p>Regulation on sustainability criteria for biofuels and greenhouse gas emissions from fuels of March 2021 – transposing RED II GHG reduction targets of Art. 29</p>
Spain	<p>Order TED/1342/2022, of 23 December 2022 – cap for crop-based biofuels as of 2023 and the cap for high ILUC-risk biofuels as of 2024.</p> <p>Royal Decree 376/2022, of 17 May 2022 – transposing the RED II provisions for biofuels and Art. 29 sustainability provisions. Also, biofuels market share mandates for the years from 2023 to 2026.</p> <p>Royal Decree-Law 6/2022, of 29 March 2022 – transposing the FQD.</p> <p>Resolution of 17 December 2021 of the Secretary of State for Energy – updating the penalty for not respecting the biofuels market share obligation as of 2022.</p> <p>Resolution of 30 September 2021 of the Secretary of State for Energy – cap on high-ILUC-risk biofuels as of 2022.</p> <p>Order ITC/2877/2008 – mechanism to promote the use of biofuels and other renewable fuels.</p> <p>NECP 2021-2030 – provisions of RED II Art. 3, 25, and 27.</p>
Sweden	<p>Act (2017:1201) on the reduction of greenhouse gas emissions from certain fossil fuels (amended in 2023) – implementing the GHG reduction targets for petrol and diesel.</p> <p>Act (2010:598) on sustainability criteria for biofuels and biofuels (amended in 2022) – setting additional sustainability criteria for no-go areas for agricultural biomass.</p> <p>Bill (2020/21:185) Sustainability criteria – implementation of the revised renewables directive – implementing sustainability criteria as in RED II Art. 29.</p>

Country	Targets	Production (in million liters, and if available)
Austria	<p>Advanced: 1% (energy) Biofuel in petrol: 3.4 % (Energy) Biofuel in diesel: 6.3% Reduction of GHG intensity in fuels: -7.5 Crop cap: 7% (palm oil excluded) Annex IX biofuels: 1% from 1 January 2025 and 3,5% from 1 January 2030</p>	260
Belgium	<p>Minimum overall biofuel target: 12.2 Advanced biofuel target: 1.1 Biofuel in petrol: 5.7 Biofuel in diesel: 5.7 Crop Cap: Petrol: 2023: max 6.5% / 2027: max 5.5% / 2030: max 4.5%. Diesel: 2023: max 6% / 2027: max 5% / 2030: max 2.5%. Palm and soil oil and derivatives forbidden with exception of low ILUC risk Annex IX-A17: . From 2025: minimum 1.1% (with multipliers)</p>	600
Bulgaria	<p>Minimum overall biofuel target: Advanced: 1 (volume, diesel), 0.05 (energy) Biofuel in petrol: 9 Biofuel in diesel: 6 Reduction of GHG intensity in fuels: Crop cap: 7% (exception: raw material compliant with sustainability criteria or from degraded or fallow land) Annex IX-A biofuels: 1% in 2025/ 3.5% in 2030</p>	185
Croatia	<p>Minimum overall biofuel target: 1 (energy) Advanced: Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 1% flexibility, 7% limit Annex IX biofuels: Annex IX-A biofuels: 0.2% in 2022, 0.3% in 2023, 0.6% in 2024, 1% in 2025, 1.3% in 2026, 1.7% in 2027, 2.1% in 2028, 2.7% in 2029 and 3.5% by 2030 Annex IX-B biofuels and biogas in transport: 1.7% by 2030</p>	
Cyprus	<p>Minimum overall biofuel target: Advanced: 1 (energy) Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 1% flexibility, 7% limit Annex IX-A biofuels: 0.2% in 2022, 1% in 2025, and 3.5% by 2030</p>	
Czechia	<p>Minimum overall biofuel target: Advanced: 1.07 (volume) Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 1% flexibility, 7% limit Annex IX biofuels: Advanced biofuels targets: 0.22% from 2022 and 1.07% from 2025, in energy Annex IX- B feedstock: 1.7%.</p>	194

Country	Targets	Production (in million liters, and if available)
Denmark	<p>Minimum overall biofuel target: Advanced: Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -5.2 Crop cap: high-ILUC-risk biofuels phased out for 2025. Biofuels based on palm oil, its by-products and soy, excluded from 2022, unless certified low-ILUC-risk. Annex IX biofuels: Annex IX-A: 1% flexibility, 7% limit Annex IX-B: 1.7%</p>	
Estonia	<p>Minimum overall biofuel target: 7.5 (Crop-based biofuels capped at 4.5%) Advanced: 0.5 Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: Crop cap: Annex IX biofuels:</p>	22
Finland	<p>Minimum overall biofuel target: 16.6 (Crop-based biofuels capped at 2.6%) Advanced: 3 Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: Crop cap: 2.6%, high-ILUC-risk biofuels: 0% Annex IX biofuels, biogas, and RFNBOs: 2% in 2021–2023; 4% in 2024–2025; 6% in 2026–2027; 8% in 2028; 9% in 2029; 10% in 2030 and beyond. Suppliers must ensure that at least a minimum amount of Annex IX-A biofuels and biogas is supplied to the market: 0.2% in 2022–2024, 1% in 2025–2029, and 3.5% from 2030. Annex IX-B: no cap</p>	70
France	<p>Minimum overall biofuel target: Advanced: 1.8 (in petrol) 0.7 (in diesel) Biofuel in petrol: 10.5 Biofuel in diesel: 9.4 Reduction of GHG intensity in fuels: -10 Crop cap: 1% flexibility, 7% limit– Separate cap for sugar residues and starch (1.1%). Soy and palm biofuels excluded. Annex IX biofuels: Annex IX-A: in petrol: 1.3% in 2024 and 3.5% by 2030. In diesel: 0.5% in 2024. Annex IX-B: 0.9%.</p>	2010
Germany	<p>Minimum overall biofuel target: Advanced: 0.7 Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: Crop cap: 4.4%. High-ILUC-risk biofuels: 0% Annex IX biofuels: Annex IX-A biofuels: 0.4% in 2024 and at least 2.6% in 2030 (without double counting). Annex IX-B biofuels and biogas: 1.9%. E-fuels for aviation: E-kerosene mandate in aviation of 0.5% in 2026, 1% in 2028, and 2% in 2030.</p>	1127

Country	Targets	Production (in million liters, and if available)
Greece	<p>Minimum overall biofuel target: 10 Advanced: 0.2 (volume) Biofuel in petrol: 3.3 (energy) Biofuel in diesel: 7 (volume) Reduction of GHG intensity in fuels: Crop cap: Annex IX biofuels:</p>	30
Hungary	<p>Minimum overall biofuel target: 8.4 Advanced: 1 Biofuel in petrol: 6.1 (RON 95) Biofuel in diesel: 0.2 (HVO) Reduction of GHG intensity in fuels: Crop cap: 4% Annex IX biofuels: 0.5% in 2024, 1% in 2025, and 3.5% by 2030. Annex IX.B biofuels 4% (before double counting)</p>	1117
Ireland	<p>Minimum overall biofuel target: 21 (volume) (49 by 2030) Advanced: 1 (energy) Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 2.3%. High-ILUC-risk.capped to 2019 levels Annex IX biofuels: 0.3 (3.5 by 2030) Annex IX-A: 0.3% in 2023, 1% in 2025, and 3.5% by 2030 Annex IX-B biofuels and biogas in transport: capped at 1.7% by 2030.</p>	10
Italy	<p>Minimum overall biofuel target: 10.8 Advanced: 9 Biofuel in petrol: 3 Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 7% (1% flexibility). High-ILUC-risk.capped to 2019 levels Annex IX biofuels: Annex IX-A biofuels and biomethane: 4.2% in 2024 and 8% in 2030. Annex IX- B biofuels cap: 2.5% without multipliers.</p>	151
Latvia	<p>Minimum overall biofuel target: Advanced: 1 (volume) Biofuel in petrol: 9.5 (RON 95) Biofuel in diesel: 6.5 Reduction of GHG intensity in fuels: Crop cap: 1% higher than 2020 consumption Annex IX-A biofuels: at 0.2% in 2022, 1% in 2025, and 3.5% by 2030, as in RED II Art. 25. Proposed legislation aims to set a combined Annex IX-A and RFNBO mandate reaching at least 5.5% from 2030, with a 1% sub-mandate for RFNBOs</p>	26
Lithuania	<p>Minimum overall biofuel target: 8.6 Advanced: 1 Biofuel in petrol: 6.6 Biofuel in diesel: 6.2 Reduction of GHG intensity in fuels: Crop cap: 1% higher than 2020 consumption levels in road and rail from 2022 onwards Annex IX biofuels: Annex IX-A biofuels and RFNBOs: min. 0.2% in 2022, min. 0.4% in 2023, min. 0.7% in 2024, min. 1% in 2025, min. 1.4% in 2026, min. 1.8% in 2027, min. 2.2% in 2028, min. 2.7% in 2029, min. 3.5% in 2030</p>	32

Country	Targets	Production (in million liters, and if available)
Luxemburg	<p>Minimum overall biofuel target: Advanced: 7.7 (9.7% with multipliers. Can be lowered to 6%. Advanced biofuels must be at least 50% of the biofuels mix after double counting) Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 5% Annex IX biofuels:</p>	
Malta	<p>Minimum overall biofuel target: Advanced: 1 Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: Crop cap: 2020 consumption levels in road and rail transport, +1% flexibility within a 7% limit Annex IX biofuels: Annex IX-A: 0.2% in 2022, 1% in 2025, and 3.5% by 2030. Cap of 1.7% for Annex IX-B biofuels does not apply to Malta.</p>	
Netherlands	<p>Minimum overall biofuel target: 28.4 Advanced: 3.6 Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: 1.4% legal exclusion of palm and soy biofuels except if low-ILUC-risk. Annex IX biofuels: Annex IX-A, based on 2020 consumption levels (double counted):</p> <ul style="list-style-type: none"> ▪ 2022: at least 1.8% ▪ 2023: at least 2.4% ▪ 2024: at least 2.9% ▪ 2025: at least 3.6% ▪ 2026: at least 4.2% ▪ 2027: at least 4.9% ▪ 2028: at least 5.6% ▪ 2029: at least 6.3% ▪ 2030: at least 7% <p>In 2023, commitment of 10.1% (target for the share of advanced biofuels of all petrol and diesel deliveries) Annex IX-B biofuels cap: 10% to the use of biofuels from used oils and fats (double counted). In 2023, the deployment of Annex IX-B biofuels only reached 6%20</p>	750
Poland	<p>Minimum overall biofuel target: 9.1 Advanced: 0.1 Biofuel in petrol: 5.3 (RON95) 4.56 (RON98) Biofuel in diesel: 5.2 Reduction of GHG intensity in fuels: Crop cap: 7% Annex IX-A biofuels: at least 0.1% in 2020.</p>	402
Portugal	<p>Minimum overall biofuel target: 13 (volume) Advanced: 2 (volume) Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: Crop cap: at 2020 consumption levels in road and rail transport, +1% flexibility within a 7% limit, excluding biofuels made from raw materials grown on degraded or fallow land Annex IX biofuels: in 2022: 0.2%, in 2023: 0.7%, in 2025 and 2026: 2%, in 2027 and 2028: 4%, in 2029: 7%, in 2030: 10%.</p>	3

Country	Targets	Production (in million liters, and if available)
Romania	<p>Minimum overall biofuel target: Advanced: Biofuel in petrol: 8 (volume) Biofuel in diesel: 6.5 (volume) Reduction of GHG intensity in fuels: Crop cap: Crop cap at 2020 consumption levels in road and rail transport, +1% flexibility within a 7% limit Annex IX biofuels: draft proposal law: Annex IX-A biofuels and biomethane at 0.2% in 2022, 1% in 2025, and 3.5% by 2030</p>	12
Slovakia	<p>Minimum overall biofuel target: 8.8 (energy) Advanced: 1.05 (volume) Biofuel in petrol: 9.2 Biofuel in diesel: 6.9 Reduction of GHG intensity in fuels: -6 Crop cap: 6% of energy content and high-ILUC-risk capped 0% Annex IX biofuels: Annex IX-A targets: 0.5% for 2023 0.65% for 2024 1.05% for 2025–2026 1.4% for 2027–2028 1.75% for 2029 2.1% for 2030 of total energy content of fuels placed on the market. The country includes new feedstock to the Annex IX-A list 21 Annex IX-B capped at 1.7% of overall share of renewables in transport, before double counting.</p>	215
Slovenia	<p>Minimum overall biofuel target: Advanced: Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: Crop cap: 2020 consumption levels in road and rail transport, +1% flexibility within a 7% limit Annex IX biofuels: Annex IX-A biofuels: 0.2% in 2022, 1% in 2025, and 3.5% by 2030. Annex IX-B biofuels and biogas in transport is capped at 1.7% by 2030</p>	
Spain	<p>Minimum overall biofuel target: 11.5 Advanced: 1 Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: in energy, at 3.5% for 2023, 3% for 2024 and 2.6% for 2025 for the biofuels market share mandate. Biofuels from palm oil, oil palm fresh fruit bunches, PFAD, palm kernel oil and palm kernel shells oil capped at 3.1% in energy for 2023, 3% for 2024 and 2.6% for 2025 for the biofuels market share mandate. Annex IX biofuels: Annex IX-A biofuels for the biofuels market share mandate at: 0.2% in 2022, 0.3% in 2023, 0.5% in 2024, 1% in 2025, 1.2% in 2026, 3.5% in 2030 Annex IX-B biofuels and biogas in transport is capped at 1.7% in energy as of 2021 both for the RES-T target and for the biofuels market share mandate.</p>	597
Sweden	<p>Minimum overall biofuel target: Advanced: Biofuel in petrol: Biofuel in diesel: Reduction of GHG intensity in fuels: -6 Crop cap: no explicit targets. High-ILUC-risk biofuels cannot be counted towards the reduction quota except if certified as low-ILUCrisk, but they may be used in high-blend biofuels not included in the reduction quota for petrol and diesel. Annex IX biofuels: no specific targets</p>	415

Annex C. Drivers and barriers for uptake

Category	Success Factors	Barriers
Policy and regulatory	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Binding national targets. "One-stop shop" permitting. Guarantees of origin and streamlined grid-connection rules accelerate investment and project delivery. Long-term biomethane targets (e.g. 35 bcm by 2030) provide market visibility. <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Firm transport blending mandates (E10/B7) + aviation and maritime quotas = stable demand signals and uptake agreements. 	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Fragmented sustainability certification. Delayed transposition of RED III criteria. Varying gas-quality requirements across Member States. <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Crop-based caps. Periodic revisions of sustainability rules.
Economic and market	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Multiple revenue streams: gate fees, energy sales, CO2 capture, digestate valorisation, guarantees of origin. Emerging biomethane hubs (enable scale economy and lower costs). <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Mature value chains for corn, wheat and sugar crops Co-product markets (vinasse¹, biogenic CO2). Existing plant capacity. 	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Feedstock cost volatility. Collection and transport logistics. Limited long-term purchase agreements deepen financing uncertainty. <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Feedstock price volatility, Weather risk and competing uses (food, feed, export).
Technical, resource and infrastructure	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Commercially mature and scalable technologies. Distributed anaerobic digestion offers circular benefits (waste, manure, residues). <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Fermentation technology and retrofittable existing plants. 2nd gen pathways unlock waste streams with strong GHG performance. 	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Low feedstock accessibility. Dispersed waste streams. Seasonal availability and lack of aggregation infrastructure Grid access constraints during low-demand periods create injection bottlenecks. <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> 2nd gen requires high capital expenditure, complex pretreatment, and lack of residue systems. Technology uncertainty and slow scaling compared with 1st gen hinder financing.
Socio-economic governance	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Local value and rural job creation. Nutrient recycling and methane-emission reduction. Municipal participation accelerates uptake and social acceptance. <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Integration with rural economies. Existing industrial base. Potential reuse of 1st gen plants. 	<p><u>Biomethane:</u></p> <ul style="list-style-type: none"> Governance fragmentation across agriculture, waste and energy jurisdictions = permitting delays, slow project execution, and no clear ownership of feedstock. <p><u>Bioethanol:</u></p> <ul style="list-style-type: none"> Food-fuel trade-offs (land-use concerns).

¹ Byproduct of the process of obtaining ethanol that may be used as a fertilizer.

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