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Sustainable aviation fuels in Europe

Is your company on top of the regulatory landscape and how policy can shape SAF deployment and opportunities?

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At a glance

- The aviation industry is one of the largest polluting sectors in the EU. Sustainable Aviation Fuels (SAF) have the potential to provide the means for the sector to decrease carbon emissions significantly as it plots a course to reach net-zero by 2050 and in line with the EU planned climate target of reducing net emissions by 90% by 2040.
- This insight analyses the current landscape on SAF. It looks at regulations which directly set targets or technical criteria for SAF. It also identifies regulation that could indirectly drive SAF deployment and adoption, as well as the actions related to SAF taken by the aviation and fuel production sectors. It concludes with an overview of the challenges to promote SAF, and the actions that the industry, regulators and standard setters can take to address them.
- Two pieces of EU legislation directly target SAF: the RefuelEU Aviation Regulation and the EU Taxonomy Regulation. The RefuelEU Aviation Regulation mandates a 2% SAF target for airport fuel suppliers in 2025 and 6% in 2030. From 2030, the mandate will gradually increase, starting with 20%, 40% in 2040, reaching 70% by 2050. The EU Taxonomy Regulation has set technical screening criteria for aviation activities to fall. By 2030, passenger transport and freight aircraft will need to operate with at least 15% of SAF. This minimum threshold will then increase at a linear rate of two percentage points per year.
- The EU Emissions Trading System (EU ETS) and the Net Zero Industry Act (NZIA) are indirectly linked to SAF. The EU ETS will reduce free carbon emission allowances to airlines, which could in turn increase SAF demand. The NZIA, which seeks to incentivise the production of net zero technologies, includes SAF as one of the technologies supported by the Act. The NZIA has been formally adopted by the EU but still requires secondary legislation to set net zero project criteria and identify components for technologies in scope. In addition to these EU initiatives, at the international level, countries such as Norway, the UK, Japan and India have made commitments to adopt SAF by 2030, which is also likely to increase demand.
- Companies are already taking action to achieve their 2030 SAF targets. For example, OneWorld alliance member airlines have pledged to use 10% of SAF by 2030. Industry groups, such as the “Clean Skies for Tomorrow Coalition”, have been launched to promote wide commercial adoption of low emission SAF by 2030. Major aircraft manufacturers have made pledges to deliver aircrafts capable of flying on 100% SAF by 2030, from the existing 50% today.
- The shorter-term challenges for companies to scale-up production and meet the 2030 SAF targets are: limited production capacity and storage; higher production costs of SAF as compared to standard jet fuel; general accounting challenges around the recognition of emissions reductions related to SAF; and competitiveness implications for airlines operating in the EU, due to a more stringent regulatory framework on SAF in the EU than in other jurisdictions.
- To address these shorter-term challenges, the practical actions that companies can take include fully understanding and assessing the costs of meeting SAF mandates, securing SAF contracts to cover the period until 2030, and investing in R&D to increase low-emission SAF supply. In addition, from a regulatory and standard setting perspective, work may be needed on guidance to align SAF reporting and ensure that there is a level playing field for the aviation and fuel production sectors between the EU and the rest of the world. These actions are necessary to help create economies of scale for SAF production, reduce risks, tackle limited SAF production and storage capacity, and provide more transparency regarding the accounting of SAF emissions.
- By 2035, SAF targets will increase threefold. Additional longer-term challenges for companies include the potential limitations to use agricultural land for feedstock to produce SAF, higher electricity demand to produce SAF, low bio-feedstock availability, and lack of technological maturity to scale-up production and provide low carbon SAF. These longer-term challenges may lead to an increased dependency on SAF imports, at a time when there will be increased competition to access limited global SAF supply.

Current landscape on SAF

The aviation industry is one of the largest polluting sectors in the EU. SAF offer the industry a strategic opportunity to reduce its carbon footprint.[1] To achieve carbon neutrality by 2050, the EU has introduced an ambitious regulatory programme under the European Green Deal. The Green Deal is a growth strategy that aims to make the EU-climate neutral by 2050 and protect the environment.

The 'Fit for 55' package, part of the Green Deal, aims to reduce net greenhouse gas emissions by at least 55% by 2030. The ReFuel EU Aviation legislation, which entered into force in November 2023, is part of this package. It aims to scale-up demand for and supply of SAF and reduce aircraft carbon emissions. The other piece of EU legislation that directly targets SAF is the EU Taxonomy Regulation, which has set technical screening criteria for aviation activities to fall within the EU taxonomy.

This legislation is complemented by the EU Emissions Trading System (EU ETS) and the Net Zero Industry Act (NZIA), which are indirectly linked to SAF.

EU legislation directly targeting SAF

ReFuelEU Aviation

The ReFuelEU Aviation legislation lists three categories of SAF: synthetics, biofuels and recycled carbon aviation fuels. Synthetic aviation fuels are comprised of 'renewable fuels of non-biological origin', renewable hydrogen or renewable electricity. From 1 January 2024, aircraft fuel suppliers at EU airports have been required to increase the supply of SAF gradually, from 2% next year, until it reaches 70% in 2050. These targets are summarised in Figure 1.

The EU predicts that, by 2030, aviation fuel demand at EU airports will reach over 46 million tonnes (Mt)[2]. To meet the goal of having a 6% SAF blend on all flights leaving EU airports, 2.76 Mt of SAF will be needed. Currently, SAF production is approximately 0.24 Mt, which is less than 10% of what is needed to meet the 2030 target[3].

Figure 1. Shares of SAF for 2025–2030 and post-2030 under ReFuel EU Aviation

	Shorter-term (2025–2030)		Longer-term (2030–2050)			
Country	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Total percentage of SAF to be used in air transport	2%	6%	20%	34%	42%	70%
Minimum percentage of synthetic fuels from total	N/A	1.2%	5%	10%	15%	35%

Source: European Parliament, 2023

The key question is how SAF production can be increased to meet the post-2030 targets, as forecasted demand to meet the 2040 and 2050 targets is likely to become even larger. The share of SAF blend is expected to be 15.6 Mt in 2040 and 32.2 Mt in 2050.

EU Taxonomy

The EU Taxonomy Regulation sets technical screening criteria for aviation activities to fall within the EU Taxonomy. By 2030, passenger transport and freight aircraft will need to operate with at least 15% of SAF. This minimum threshold will then increase at a linear rate of two percent percentage points per year. Companies aiming to align their aviation activities with the taxonomy will have to meet this increasing threshold. The 2030 threshold under the taxonomy, while not mandatory, is initially more ambitious than the ReFuelEU Aviation target, and applies to group level rather than just EU flights. However, by 2040, both targets will be at similar levels (35 and 34 percent, respectively).

International developments directly targeting SAF

In addition to pan-EU initiatives, other regions have made commitments to scale-up SAF production by 2030. Overall, the international landscape surrounding SAF is similar to the EU's (see Figure 2). The parallel between international and EU initiatives is that both seek to drive SAF demand by setting SAF targets and pledges, and by incentivising production or research and development (R&D) in new technologies to meet demand.

The main difference between EU and international developments on SAF is timing. Shorter-term international targets (2025 and 2030) are generally less ambitious or not binding internationally, and longer-term targets (2040 and 2050) are less clear than in the EU.

EU legislation indirectly linked to SAF

The EU ETS and the NZIA are indirectly linked to SAF.

The EU ETS will gradually reduce carbon allowances for airlines (see Deloitte analysis on EU ETS here). By setting a carbon price on transport emissions, including aviation, the EU ETS aims to generate revenue to develop and implement zero-emission technologies and fuels. In 2026, the Commission will assess expanding carbon pricing to aviation and maritime sectors.[4] Prioritising low- and zero- emission fuels for the aviation and maritime sectors, over sectors with more alternatives to decarbonise, will help the EU to meet its climate goals and support the global climate agenda.

1 Source: Position of the European Parliament EP-PE_TC1-COD(2021)0205, p. 44
2 Source: General Information and context | European Alternative Fuels Observatory (europa.eu)

3 Sources: Current landscape and future of SAF industry | EASA Eco (europa.eu); General Information and context | European Alternative Fuels Observatory (europa.eu)

4 Source: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (European Commission, 2024)

Figure 2. International regulatory developments on SAF

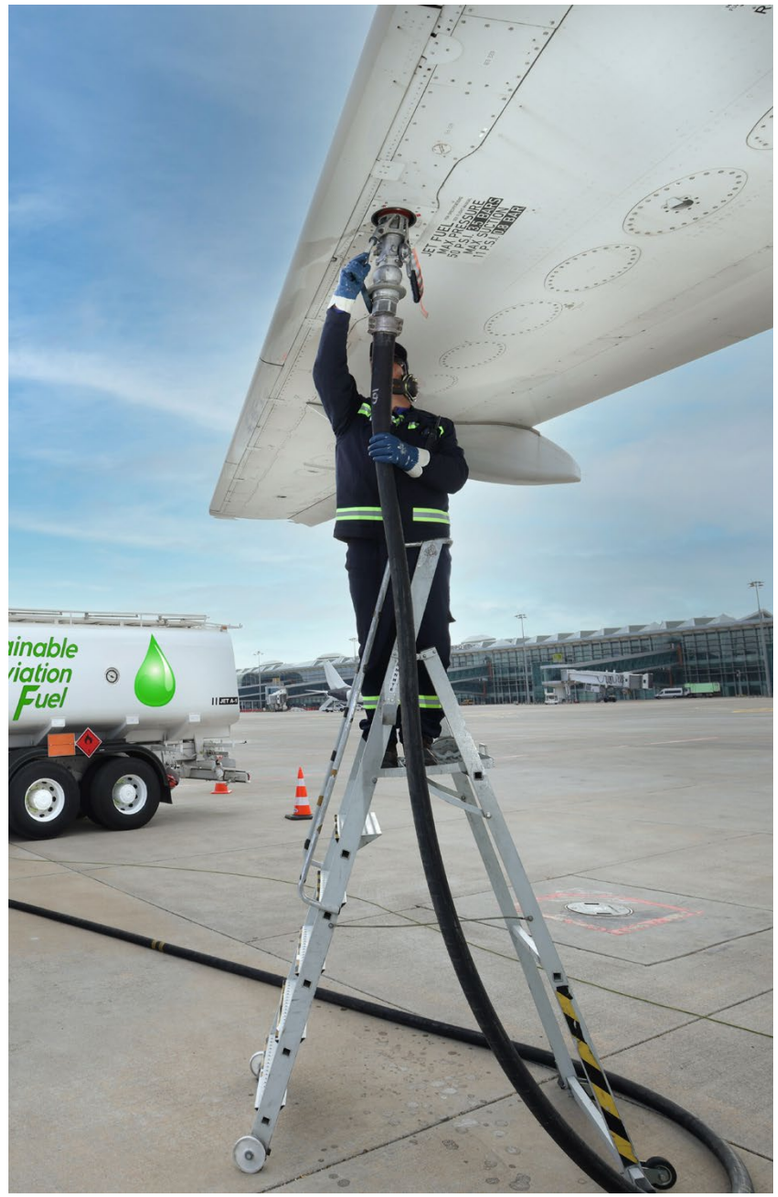
Region	Development	Regional impact of the regulation
Europe	**UK:** SAF mandate to enter into force in 2025 at 2% of total UK jet fuel demand. The mandate will increase to 10% in 2030, and 22% in 2040. The 22% will remain until there is greater certainty on SAF supply. The UK also seeks to encourage innovation by setting up caps for SAF derived from existing technologies (e.g. hydroprocessed esters and fatty acids, also known as HEFA SAF), and creating a 3.5% target for power from liquid fuels by 2040. Read more about the new UK government's sustainability policies in our article, here.	**Medium impact**
The Americas	**US**: Goal to increase SAF production to at least 3 billion gallons per year by 2030.	**High impact**
Asia	**Japan**: 10% of SAF mandate for international flights using Japanese airports from 2030.	**Medium impact**
	Singapore: Envisions 1% SAF target starting in 2026, with plans to increase it to 3–5% by 2030, contingent on global developments and wider availability and adoption of SAF.	**Low impact**
	Malaysia: 1% SAF blending mandate. Targeted 47% SAF blending mandate by 2050.	**Low impact**
	India: Envisions 1% SAF target by 2027, doubling to 2% in 2028. SAF targets will initially apply to international flights.	**Low impact**

In addition to these developments, Brazil, China and Indonesia are considering potential SAF mandates in the future, and Australia has included SAF in key roadmaps and initiatives.
Source: Deloitte analysis, 2024

The NZIA supports the deployment of net-zero technologies by setting, from 2030, the goal that the EU's production capacity should provide at least 40% of the EU's annual demand for such technologies. To meet this goal, the NZIA includes access to funding, incentives and a simplified regulatory environment for net zero projects. SAF technologies and renewable non-biological fuels are listed as qualifying technologies under the NZIA. The NZIA is likely to increase the production of SAF, which would be instrumental for airlines seeking to reduce their emissions under EU ETS, driving SAF demand. The NZIA has been formally adopted by the EU but still requires secondary legislation to set net zero project criteria and identify components for technologies in scope.

The EU ETS and the NZIA also interact with the EU's 2040 climate vision, which seeks to decrease net emissions by 90% by 2040. To achieve this vision and for the aviation sector to remain competitive, it will be necessary to ensure that there is enough SAF supply, and that SAF are cost effective, as compared to conventional aviation fuel.

In conclusion, the regulatory drivers of SAF are complex and, given these EU and international developments, SAF demand may develop more quickly than expected, to meet shorter-term goals. SAF production capacity doubled in 2023 as compared to 2020, reaching over 600 million litres.[5] While this increase is a step in the right direction, the EU is currently only capable of producing less than 10% of the total amount needed to achieve the mandate by 2030[6].



5 Source: EBACE2024: Experts Say SAF Supply, Demand Rising; Production Expected to Increase
6 Sources: Current landscape and future of SAF industry | EASA Eco (europa.eu); General Information and context | European Alternative Fuels Observatory (europa.eu)

Current actions taken by the aviation and fuel production sectors

Companies are making pledges to increase their share of SAF to try to achieve the 2030 goals, including:

- **Airline commitments.** OneWorld alliance member airlines pledged in 2021 to have 10% of SAF by 2030. To achieve this objective, around 9 Mt of SAF are required.[7]
- **Accelerate biofuel deployment.** Several initiatives have been launched to accelerate biofuel deployment.[8] Amongst these, the "Clean Skies for Tomorrow Coalition" is an industry-led coalition to promote the commercial sale of low-emission SAF for wide industry adoption in 2030.
- **Aircraft development.** Major aircraft manufacturers have made pledges to deliver aircrafts capable of flying on 100% SAF by 2030, from the existing 50% as of today.

7 Source: Scaling Up Sustainable Aviation Fuel Supply: Overcoming Barriers in Europe, the US and the Middle East (World Economic Forum, 2024)
8 Source: Biofuels - Energy System (International Energy Agency, 2023)

Key challenges for companies to achieve 2030 targets

There are four key challenges for the aviation and the fuel production sectors to scale-up production and use of SAF and ensure they can achieve their 2030 SAF targets. These are: **limited production capacity and storage, higher production costs of SAF as compared to standard jet fuel; accounting challenges around the recognition of emissions reductions related to SAF; and competitiveness implications for airlines operating in the EU, due to a more stringent regulatory framework on SAF in the EU than in other jurisdictions.**

Limited production capacity and storage

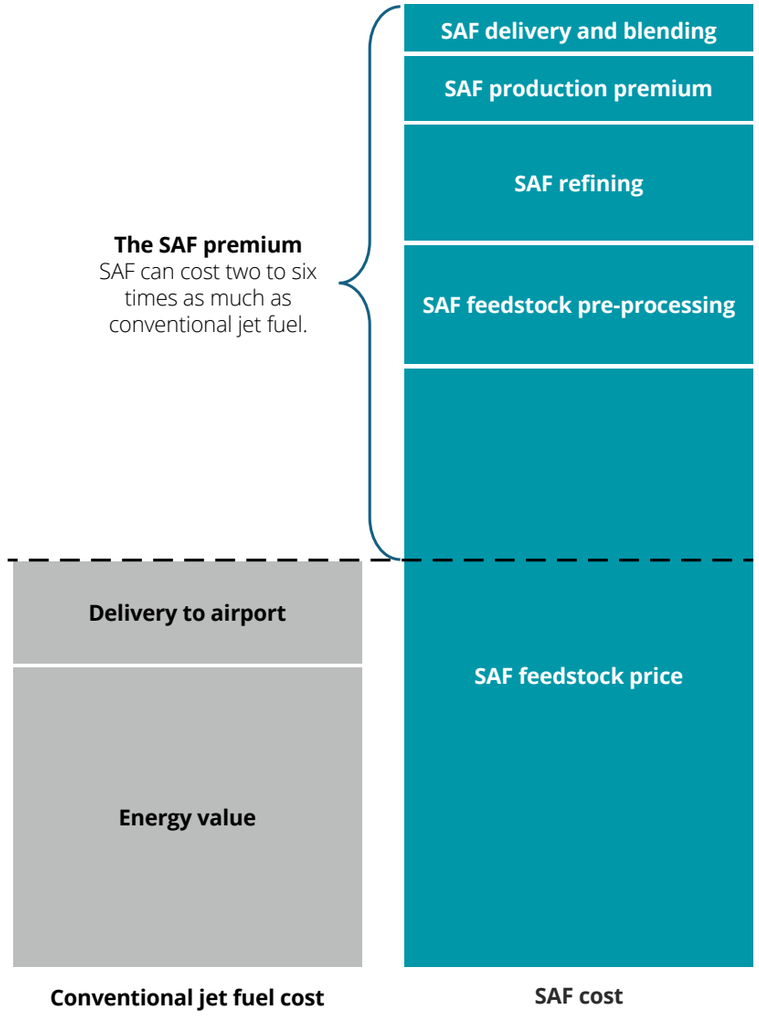
The maximum potential SAF production capacity in the EU is currently insufficient to meet the 5 Mt needed by 2030 under ReFuel EU Aviation.[9] SAF production worldwide is approximately 1.5 Mt per year, amounting to just half of one percent of jet fuel production.[10] From this total, the EU produces approximately 50%.[11] Furthermore, EU airports are required to have adequate storage capacity infrastructure for SAF close to airport perimeters. This will require the deployment of additional storage facilities at over 2,000 EU airports to meet the requirement by 2030. In addition, second- and third-tier airports are likely to have lower priority access to SAF as compared to first-tier airports. Transporting SAF to second- and third-tier airports can also be more challenging because of geographical reasons.[12]

High production costs

Current costs of SAF, ranging from €1,000 to over €4,500 per tonne, are around two to six times higher than fossil-based aviation fuels (see Figure 3).[13] High production costs vary due to the range of technologies available,

9 Source: Current landscape and future of SAF industry (European Union Aviation Safety Agency, 2024)
10 IATA, 2023
11 S&P Global, 2024
12 Source : Ahead of Mandates, Sustainable Aviation Fuel Supply Slowly Grows in Europe | Aviation International News (ainonline.com)
13 International Civil Aviation Organisation, 2024

Figure 3. Comparison between conventional jet fuel cost and SAF cost



Source: Deloitte analysis, 2024.

alongside limited certainty on SAF production costs (e.g. the evolution of electricity mix prices, feedstock prices).[14]

Accounting challenges around the recognition of emissions reductions related to SAF

There is currently no guidance under the Greenhouse Gas Protocol (GHGP) and Science-Based Target Initiative (SBTi) to recognise emissions reductions related to SAF. This affects Scope 3 emission reporting for airlines, and companies using SAF for cargo or business flights,as under the current frameworks they cannot claim reduced Scope 3 emissions for using SAF (see Deloitte analysis on business travel here). Thus, companies currently do not have an incentive in terms of reduced reported emissions to pay more for services using SAF.

Competitiveness implications for the EU aviation sector

There are competitiveness implications for airlines in the EU, due to a more stringent regulatory framework on SAF in the EU than in other jurisdictions. For example, EU air carriers typically have thin profit margins, which deters them from procuring large volumes of SAF as this would have a significant impact on their cost structure and harm their competitiveness.[15] Furthermore, taxation on aviation fuel cannot be extended to non-EU carriers leading to a competitive disadvantage for EU carriers.[16] Accordingly, it makes it more difficult to incentivise the use of SAF through fuel taxes or fuel tax exemptions. Lastly, the target share of SAF blend in 2030 is 6% in the EU, reaching 70% in 2050, while in other regions it will be less than 5% and 50% respectively at the same points in time.

Longer-term challenges (2030–2050)

To meet post-2030 targets, a significant amount of capital will be needed to support investment in new technologies and production facilities to ensure that increased SAF demand can be met. Additional challenges include potential limitations to use of agricultural land for feedstock to produce SAF, higher electricity demand to produce SAF, low bio-feedstock availability, and lack of technological maturity to scale-up production an provide low carbon SAF. These challenges may lead to an increased dependency of SAF imports, at a time when there will be increased competition to access limited global SAF supply.

Practical actions that companies, GHG standard setters and regulators can take to promote SAF

There are several actions that the aviation and fuel production sectors, GHG standard setters and regulators can take to scale-up production and use of SAF to achieve the 2030 targets and put the industry on the right path to achieve the more ambitious post-2030 targets. These actions are necessary to create economies of scale for SAF production, help reduce risk, tackle limited SAF production and storage capacity, and provide more transparency regarding the accounting of SAF emissions. (See Figure 4 on next page)

Conclusion

In summary, the share of SAF used in the aviation sector will increase in the coming years, not only in the EU but internationally. There are challenges to scale-up SAF production, especially in the longer-term (2030–2050). In the shorter-term, companies in the aviation and fuel production sectors can start taking steps to meet SAF targets, drive innovation and decarbonise. In addition, due to the changing regulatory landscape on SAF, it is essential for companies to be on top of regulatory developments, timelines, and policy implementation, to capitalise on the opportunities created by regulation and frameworks.

14 Source: Current landscape and future of SAF industry (European Union Aviation Safety Agency, 2024)
15 Source: Study supporting the impact assessment of the ReFuelEU Aviation initiative - Publications Office of the EU (europa.eu)
16 Source: Study supporting the impact assessment of the ReFuelEU Aviation initiative - Publications Office of the EU (europa.eu)

Figure 4. Practical actions for companies, GHG standard setters and regulators to promote SAF

Actors	Challenges	Practical actions
Airline and aircraft operators	• Higher production costs of SAF as compared to standard jet fuel. • General accounting challenges around the recognition of emissions reductions related to SAF. • Competitiveness implications for airlines operating in the EU.	• Estimate increased costs associated with SAF purchases to meet regulatory mandate. • Cost-sharing with end-consumers, by updating existing pricing models. This would allow business travellers to take a larger part of the cost in exchange for lower CO2 emissions. • Partnering with the rest of the aviation industry in the EU (e.g. aircraft fuel suppliers and/or airports) to enable economies of scale by means of investments through grants and incentives (e.g. Innovation Fund, ReFuel EU).
Aircraft fuel suppliers	• Limited production capacity and storage. • Higher production costs of SAF as compared to standard jet fuel.	• Investing in R&D for SAF technological advancements which could decrease SAF production costs in the future. This includes early investment in start-ups, pilot plants and long-term contracts with airlines. High investment may help to increase the percentage of taxonomy-eligible activities. • Secure long-term agreement for SAF supply contracts, including certainty of delivery for both parties. • Foster cross-sector alliances and manage stakeholder relationships in advocating increased use of SAF over conventional jet fuel.
EU airports	• Limited production capacity and storage. • Second- and third-tier airports will likely have lower priority access to SAF.	• Identify which suppliers to work with to secure supply needed, to ensure coordination with fuel supplier and airlines. • Invest in SAF deployment solutions, namely, to build infrastructure for SAF roll-out based on the amount of SAF uplifted at the airport and suppliers identified. • Ensure a fair distribution of SAF between first, second and third-tier airports, based on the mandates provided by the ReFuel EU Aviation Regulation.
GHG standard setters and regulators	• Higher production costs of SAF as compared to standard jet fuel. • General accounting challenges around the recognition of emissions reductions related to SAF.	• Publish industry guidance to align SAF reporting requirements globally with standards already outlined by GHGP and SBTi. • Implement guarantees of origin by means of electronic documents for different sources of SAF to provide proof that the SAF was produced from renewable sources. • Implement emissions certification when accounting for Scope 3 emissions. • European legislators could implement feedstock certification to ensure accountability and transparency for customers. • Learn from other fuels experience (e.g., biofuels) and coordinate with agribusiness players. • Align incentives to help with SAF premiums.

Source: Deloitte analysis, 2024

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About the EMEA Sustainability Regulation Hub

The EMEA Sustainability Hub is a source of critical regulatory strategy insight and advice, designed to help business leaders understand and assess how sustainability regulation will drive the evolution of business strategies and operating models. As sustainability regulatory requirements and standards expand, it is essential to adopt a strategic approach to navigate the complexity, and to engage with regulators proactively. We develop early insights across industries on emerging EU sustainability regulations, policies, industry standards and codes of conduct to help you assess how best to transform strategies and operating models.

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