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Sustainability Criteria for Renewable Hydrogen

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10.1 INTRODUCTION

Hydrogen can come in all shapes and forms. According to the so-called colour-book of hydrogen, several different types of hydrogen exist and are clustered depending on their production method and input (electricity, gas, and so on). However, things are even more complicated given that different terminology exists in different regions of the world. This chapter focuses on Europe. The use of hydrogen terminology by European institutions has been explained before in this book by Leigh Hancher and Simina Suciu[1] and will not be repeated here. The focal point of this chapter is, in line with these EU definitions, renewable hydrogen. Renewable hydrogen means hydrogen produced with the help of renewable energy carriers, such as electricity from solar panels and wind turbines. Whether renewable hydrogen produced from biomass is part of that definition or instead is defined as biogas is still debated between European institutions at the time of writing.[2]

The Hydrogen and Decarbonized Gas package is finally well on its way to implementation and it contains a revised Gas Directive (hereinafter rGD).[3] This rGD indirectly features sustainability criteria for hydrogen. Indeed, article 8 (1) rGD requires renewable gases to be

[1] For details see Chapter 2 in this book: Leigh Hancher and Simina Suciu, 'Hydrogen Regulation in Europe: The EU's "Hydrogen and Decarbonized Gas" Package'.

[2] The proposition of the Council can be found at Recital 9 of Council of the European Union Interinstitutional file 2021/0425(COD) Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen (recast) – Analysis of the final compromise text with a view to agreement at <https://data.consilium.europa.eu/doc/document/ST-16516-2023-INIT/en/pdf> accessed 2 January 2024. The opposite position (no separate treatment) by the Commission can be found at Recital 9 of European Commission Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen COM/2021/803 final <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0803> accessed 2 January 2024.

[3] At the time of writing there is a political compromise between the three EU institutions and agreement on the shape and guise of a common Gas Directive, see: Council of the European Union Interinstitutional file 2021/0425(COD) Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen (recast) – Analysis of the final compromise text with a view to agreement, available at <https://data.consilium.europa.eu/doc/document/ST-16516-2023-INIT/en/pdf> accessed 2 January 2024. Moreover, European Commission Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen COM/2021/803 final <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021PC0803> accessed 2 January 2024.

certified in accordance with articles 29, 29a and 30 of the 2023 Renewable Energy Directive (RED III).[4] Renewable gases encompass biogas and renewable fuels of non-biological origins (RFNBOs).[5] RFNBOs are themselves defined as liquid and gaseous fuels, the energy content of which is derived from renewable sources other than biomass.[6] This is where renewable hydrogen lies. All this means that RED III's bioenergy sustainability criteria should also apply to renewable hydrogen.

To guarantee that RFNBOs are indeed of renewable origin, they have to comply with a 2023 Delegated Act from the Commission.[7] This Delegated Act was adopted as required by RED III.[8] For hydrogen to be considered as renewable, the electrolyser must consume electricity either through a direct connection to a generation plant using renewable sources, or through a connection to the grid with the condition that it runs overwhelmingly on renewable sources, or otherwise through power purchase agreements with generation from renewable sources and additionality, temporal correlation and geographical correlation rules. These rules all apply to hydrogen whether produced inside the EU or imported,[9] and they come on top of the sustainability criteria.

For a genuine transformation and decarbonization of our energy systems, a lot of hydrogen needs to be produced globally. However, when looking into renewable hydrogen specifically, it becomes immediately clear that production conditions differ widely across the globe, as the sun does not shine equally bright and the wind does not blow equally strong everywhere. As a result, some areas and regions will be far more suitable for the production of renewable hydrogen than others. The crux is that, despite great differences in possibilities for production, renewable hydrogen will be required all around the world. Thus, trade in hydrogen becomes crucial. Some countries might be able to export surplus production of hydrogen, while others will have great demand in terms of import.

The International Energy Agency (IEA) did extensive research into these geographical disparities around the globe and compiled the results in its Global Hydrogen Review 2022.[10] According to this, an estimated 12 million metric tons (Mt) of hydrogen could be exported annually by 2030 around the globe, with 2.6 Mt/year planned to come online by 2026.[11] Of the 12 Mt H2/year of planned exports by 2030, the region with the largest amount is Latin America (3.0 Mt H2/year). This is followed by Australia (2.7 Mt H2/year), Europe (1.79 Mt H2/year), Africa (1.7 Mt H2/year), North America (1.1 Mt H2/year), Middle East (1.0 Mt H2/year) and Asia (0.7 Mt H2/year).[12] Abundant solar, wind and hydropower resources to supply clean electricity for electrolysis is a key driver of these projects.[13]

[4] Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652.

[5] rGD, art 2 (2).

[6] RED III, art 2 (36).

[7] Commission Delegated Regulation (EU) 2023/1184 of 10 February 2023 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin (hereinafter: Delegated Act).

[8] As the Delegated Act was adopted before RED III, it still refers to art 27 (3) RED II, but in RED III this provision is now numbered 27 (6).

[9] Delegated Act, art 1.

[10] International Energy Agency (IEA), 'Global Hydrogen Review 2022' (2022) <https://iea.blob.core.windows.net/assets/c5bc75b1-9e4d-460d-9056-6e8e626a11c4/GlobalHydrogenReview2022.pdf> accessed 13 September 2023.

[11] Ibid 6 and 162.

[12] Ibid 163–164.

[13] Ibid.

As opposed to this export capacity, import capacity around the globe is lagging. Of the 12 Mt H2/year of proposed exports by 2030, only projects accounting for 2 Mt H2/year have made off-take agreements or have a potential off-taker in a project consortium.[14] Projects representing a further 2.6 Mt H2/year cite intend export to a specific region but do not have off-take agreements.[15] The remaining 7.5 Mt H2/year of projects have not announced proposed delivery destinations.[16]

However, of interest is the regional breakdown of the expected imports: the biggest importer by 2030, according to IEA projections, is Europe with 1.9 Mt H2/year.[17] The EU itself estimates that it will produce 10 million tonnes of renewable hydrogen by 2030 and sees the need to import a further 10 million tonnes by 2030.[18] Given that Europe is projected to have the biggest demand for hydrogen imports, it is worthwhile asking in particular if there are and/or should be requirements and conditions for all that hydrogen that is expected to come to Europe. In particular, the 2020 European Hydrogen Strategy is putting strong emphasis on the import of renewable hydrogen, as opposed to other types of hydrogen.[19]

The question that this raises is: do all stakeholders agree on similar criteria for what exactly is renewable hydrogen and when it can be considered sustainable? Indeed, to meet the EU's import ambitions in terms of renewable hydrogen, a clear system of criteria must exist to avoid 'green washing' of hydrogen that has been produced by 'non-green' methods. Given the above-described recent changes in legislation concerning, for example, RFNBOs, now might be a good moment to clarify the sustainability dimension of the future legislation and make some suggestions. It might make sense to take a step back and assess whether or not the sustainability criteria that currently exist in EU law for bioenergy make sense, what the critique is and whether or not these (or other) criteria on sustainability should be applied to the production and import of hydrogen into the EU.

A common starting point to find out if something can be labelled as 'green' or not are criteria that relate to the sustainability of the product, here hydrogen. Sustainability criteria for fuels and energy carriers are well-known in EU law, particularly in the context of the import of bioenergy into the EU. After this introduction, the chapter discusses below in Section 10.2 what sustainability criteria are, how they have been used in EU law on bioenergy and what type of critique has arisen. Section 10.3 then provides an analysis on sustainability criteria and how they can be used (or not) for hydrogen purposes, before concluding with some reflections and recommendations on the directions that the transposition of EU legislation into Member State (MS) law should take and, possibly, further amendments.

10.2 SUSTAINABILITY CRITERIA FOR BIOENERGY IN EU LAW

10.2.1 *What Are Sustainability Criteria?*

To address the notion of sustainability criteria one must first refer to the concept of sustainable development. In the early 1970s, sustainable development emerged as an alternative to the

[14] Ibid 166.
[15] Ibid 166–167.
[16] Ibid.
[17] Ibid.
[18] European Commission, 'Hydrogen' <https://energy.ec.europa.eu/topics/energy-systems-integration/hydrogen_en> accessed 20 January 2024.
[19] European Commission, 'A hydrogen strategy for a climate-neutral Europe', COM(2020) 301 final, at 19–21 <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0301> accessed 2 January 2024.

unlimited economic growth model and in response to the previous decades' concerns about risks and damage of technological advances, development failures and evident growth limits in an already overexploited planet.[20] Recognizing the tension between economic growth and environmental protection, the 1987 Brundtland Commission report *Our Common Future* defined sustainable development as 'development which meets the needs of current generations without compromising the ability of future generations to meet their own needs'.[21] The report emphasized the needs and interests of human beings and stressed the necessity to apply an integrated decision-making process taking into account both economic development and environmental protection to further human welfare.[22] Since then, and especially since the 1992 Earth Summit in Rio de Janeiro, sustainable development has gained popularity and prominence in varied spaces and discourses, has been placed at the centre of international development policy and has been incorporated into numerous national and supranational legal instruments.[23]

While the Brundtland definition of sustainable development is the most widely used, a plethora of other definitions, meanings, approaches and interpretations exists.[24] Some argue that because of its complex and disparate historical origins, sustainable development 'remains both context specific and ontologically open'.[25] Yet it is widely admitted that sustainable development rests on three distinct but interdependent, equally important and mutually reinforcing pillars, namely environmental, social and economic. The environmental pillar (environmental sustainability) requires the preservation and maintenance of the natural environment to support development and human quality of life. The social pillar (social sustainability) encompasses many issues such as human rights, equality, cultural identity and public participation, all of which promote peace and social stability. Lastly, the economic pillar (economic sustainability) implies the maintenance of the natural, social and human capital required for incomes and living standards.[26] Sustainable development can only be achieved through multilevel efforts to integrate these three pillars in a balanced way, so prioritizing is not an option; they 'cannot be pursued in insolation for S[ustainable] D[evelopment] to flourish'.[27]

Although sustainable development has achieved notorious prominence in various spaces, it remains a highly contested concept. For instance, it has been criticized for being a rather vague, ambiguous and inherently anthropocentric and political concept, based on Western thinking and serving neoliberal interests by not questioning the economic growth ideology or the

[20] Jacobus A Du Pisani, 'Sustainable development – historical roots of the concept' (2006) 3(2) Environ Sci 83 (hereinafter: Du Pisani); Robert B Gibson and others, *Sustainability Assessment: Criteria and Processes* (Earthscan, 2005) 47 (hereinafter: Gibson et al).

[21] World Commission on Environment and Development, *Our Common Future* (Oxford University Press, 1987) 43.

[22] Ibid 37–41.

[23] With the adoption of the Sustainable Development Goals in 2015, the international commitment to action on sustainable development in all sectors of the development agenda was reaffirmed. See, for instance, Du Pisani; Justice Mensah, 'Sustainable development: Meaning, history, principles, pillars, and implications for human action: Literature review' (2019) 5(1) Cogent Soc Sci 1 (hereinafter: Mensah); Tomislav Klarin, 'The concept of sustainable development: From its beginning to the contemporary issues' (2018) 21(1) ZIREB 67 (hereinafter: Klarin).

[24] Colin C Williams and Andrew C Millington, 'The diverse and contested meanings of sustainable development' (2004) 170(2) Geogr J 99 (hereinafter: Williams and Millington); Klarin.

[25] Ben Purvis, Yong Mao and Darren Robinson, 'Three pillars of sustainability: In search of conceptual origins' (2018) 14 Sustain Sci 681, 692 (hereinafter: Purvis, Mao and Robinson).

[26] Klarin; Mensah 10; On the complex dynamic interrelations between economic, environmental and social aspects see, for instance, Rodrigo Lozano, 'Envisioning sustainability three-dimensionally' (2008) 16(17) J Clean Prod 1838 (hereinafter: Lozano).

[27] Mensah 15.

consumerist culture.[28] Others consider sustainable development as an oxymoron because economic development or growth is inconsistent with environmental protection or sustainability.[29] Despite criticisms, it is argued that sustainable development has become the internationally accepted decision-making framework for achieving, maintaining and improving human well-being for both the present and future generations and that the challenge is to use and improve this framework taking into account and seeking to achieve environmental protection, social justice and economic development.[30]

Tying sustainable development to sustainability, both concepts are frequently used interchangeably, while they are intrinsically different: sustainable development is the journey to achieve sustainability.[31] Yet some argue that sustainability 'has been co-opted into the sustainable development discourse where development is first and foremost about human survival and meeting human needs, but does not necessarily have much to do with genuine sustainability, which is reliant upon the continuation of the earth'.[32] For others, the 'transformation and operationalization at the practical level' is the main obstacle regarding both concepts.[33]

Sustainable development and sustainability form the basis for understanding sustainability criteria and their content. Sustainability criteria have been explored from various scientific perspectives and interpreted in different ways.[34] Defining product sustainability criteria, Pavlovskaia states that these 'are requirements to the sustainable quality of a product and its sustainable production, which have to be fulfilled in order to acquire a sustainability status or certification'.[35] In this sense, it is argued that product sustainability criteria can be applied to identify unsustainable trends and effects and to assess opportunities and risks deriving from economic, environmental and social sustainability dimensions, also helping to assure long-term sustainability and secure investment.[36]

Sustainability criteria can be binding when included in a legal framework – for instance, the EU's binding sustainability criteria for bioenergy as detailed in Section 10.2.2, but can also be established in voluntary schemes, such as those existing in the coffee sector.[37] These criteria can be of a qualitative or quantitative nature; are usually developed for certain purposes and according to specific conditions; are not static, so continuous assessment, reconsideration and improvement can be required; and different actors at different levels can be responsible for setting and supporting their implementation.[38]

The three pillars of sustainable development, it has been argued, 'are attractive as organizing categories for sustainability criteria'.[39] In fact, it could be said that, to avoid negative

[28] See, for instance, Williams and Millington; Du Pisani; Purvis, Mao and Robinson; Sophia Imran, Khorshed Alam and Narelle Beaumont, 'Reinterpreting the definition of sustainable development for a more ecocentric reorientation' (2014) 22(2) Sust Dev 134; John C Dernbach and Federico Cheever, 'Sustainable development and its discontents' (2015) 4(2) TEL 247 (hereinafter: Dernbach and Cheever).

[29] Michael Redclift, 'Sustainable development (1987–2005): An oxymoron comes of age' (2005) 13(4) Sust Dev 212.

[30] Dernbach and Cheever.

[31] Lozano.

[32] Heather M Farley and Zachary A Smith, *Sustainability: If It's Everything, Is It Nothing?* (Routledge, 2013, 1st ed) 150.

[33] Evgenia Pavlovskaia, 'Sustainability criteria: Their indicators, control, and monitoring (with examples from the biofuel sector)' (2014) 26(17) Environ Sci Eur 1, 2 (hereinafter: Pavlovskaia).

[34] Ibid.

[35] Ibid 2.

[36] Ibid.

[37] Sustainability criteria in legal frameworks and voluntary sustainability standards usually coexist and may overlap, see Pavlovskaia.

[38] These actors include international institutions, states, independent bodies established by states, NGOs, producers and users. Pavlovskaia.

[39] Gibson et al 94.

sustainability impacts – for instance of a product – sustainability criteria should comprehensively address the most urgent sustainability concerns focusing on environmental, social and economic aspects, as they all are important to assure sustainability compliance, although particular contexts and specific conditions should be considered when identifying and developing the criteria.[40]

Moreover, for sustainability criteria to work as intended, they should be understandable and it should be possible to implement and monitor them, as well as to control compliance through the establishment of an organizational structure.[41] To verify compliance with defined sustainability criteria, certification processes have been created in some cases – for instance, to certify that a product was sustainably produced.[42] Thus, alongside the creation of different types of sustainability criteria, different certification systems have also been established.[43] In any case, it is argued that the establishment and implementation of sustainability criteria should be done in a transparent and consistent manner and that the control systems linked to their fulfilment should be reliable, trustworthy and transparent.[44]

10.2.2 *Sustainability Criteria for Bioenergy in EU Law*

Sustainability criteria for the production and import of bioenergy into the EU were included in the law for the first time in the 2009 Renewable Energy Directive (hereinafter RED I).[45] The scope of this Directive was limited to biofuels and bioliquids. According to the Directive, both are produced from biomass, but biofuels are liquid or gaseous fuels for transport, while bioliquids are liquid fuels for energy purposes other than for transport, including electricity, heating and cooling.[46]

The mandatory sustainability criteria of the EU have two components. First, biofuels and bioliquids must achieve a certain threshold of greenhouse gas (GHG) emissions savings in comparison to the use of fossil fuels.[47] Second, the raw materials cultivated for the production of biofuels or bioliquids must not come from land with high biodiversity value, land with high carbon stock or from peatlands.[48] If these criteria are not met, the biofuels or bioliquids can still enter and be sold in the EU market, but they cannot receive financial support or count towards the renewable energy targets of EU MSs.[49]

Compliance with the sustainability criteria must be proven by the producers of biofuels or bioliquids through independent audits;[50] in other words, through private voluntary certification schemes. Alternatively, third countries may conclude bilateral or multilateral agreements

[40] Thuy Mai-Moulin and others, 'Effective sustainability criteria for bioenergy: Towards the implementation of the European renewable directive II' (2021) 138 RSER 1 (hereinafter: Mai-Moulin et al); Gibson et al 115.

[41] Pavlovskaia.

[42] This is the case of the sustainability verification and certification defined in the RED for bioenergy. See Section 10.2.2.

[43] Mai-Moulin et al.

[44] Ibid; Pavlovskaia 9.

[45] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, arts 17 and 18. The same criteria were also included in parallel in a revision to the Directive 98/70/EC of 13 October 1998 relating to the quality of petrol and diesel fuels.

[46] Ibid art 2 (h) and (i).

[47] Ibid art 17 (2).

[48] Ibid art 17 (3)–(5).

[49] Ibid art 17 (1).

[50] Ibid art 18 (3).

providing for sustainability criteria equivalent to those in the Directive,[51] exempting the producers from independent audit.[52] However, the vast majority of producers of biofuels and bioliquids made use of the private schemes instead of these options.[53]

In addition to the sustainability criteria, the European Commission must report every two years to the European Parliament and the Council on the impact of the increased demand for biofuels on the availability of food and on social sustainability in and outside of the EU.[54] It must also report on the respect for land use rights and indicate whether the supplying countries have ratified and implemented a number of Conventions of the International Labour Organization (ILO).[55] Auditors of private schemes also have reporting obligations on topics not limited to the sustainability criteria. They must inter alia provide information about soil, water and air protection, about the restoration of degraded land and about the avoidance of excessive water consumption in areas where water is scarce.[56]

In the midst of mounting controversy on the effect of the increase in biofuels consumption in the EU on food prices and about their real GHG emissions savings,[57] RED I was amended in 2015.[58] This amendment mainly served to include provisions to limit indirect land use change (ILUC). ILUC happens where pasture or agricultural land previously destined for food and feed markets is diverted to biofuel production, displacing the non-fuel demand to new, non-agricultural land.[59] When this involves the conversion of land with high carbon stock, it can lead to significant GHG emissions.[60] To tackle this issue, the amended directive caps the total share of energy from biofuels produced from food crops to 7 per cent of the final consumption of energy in transport in the EU by 2020.[61]

Only three years later, RED I was overhauled and gave place to RED II.[62] This new version of the Directive separates sustainability from GHG emissions saving criteria[63] while they were mashed in RED I. Yet the criteria follow the same logic: they are mandatory but limited to GHG emissions savings on the one hand and the risk of land use change on the other.[64] They do not

[51] Ibid art 18 (4).
[52] Ibid art 18 (7).
[53] Juan Ignacio Staricco and Monica Buraschi, 'Putting transnational "hybrid" governance to work: An examination of EU-RED's implementation in the Argentinean biodiesel sector' (2022) 131 Geoforum 185, 186 (hereinafter: Staricco and Buraschi).
[54] RED I, art 17 (7).
[55] Ibid.
[56] Ibid art 18 (3).
[57] Karl Mathiesen, 'Are biofuels worse than fossil fuels?' *The Guardian* (29 November 2013) <www.theguardian.com/environment/2013/nov/29/biofuels-worse-fossil-fuels-food-crops-greenhouse-gases> accessed 11 December 2023; James Crisp, 'Biodiesel worse for the environment than fossil fuels, warn green campaigners' Euractiv (26 April 2016) <www.euractiv.com/section/climate-environment/news/biodiesel-worse-for-the-environment-than-fossil-fuels-warn-green-campaigners> accessed 11 December 2023; Harish K Jeswani, Andrew Chilvers and Adisa Azapagic, 'Environmental sustainability of biofuels: A review' (2020) 476(2243) Proc R Soc A 1, 11 (hereinafter: Jeswani, Chilvers and Azapagic).
[58] Directive (EU) 2015/1513 of 9 September 2015 amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources.
[59] Ibid recital 4.
[60] Ibid.
[61] Ibid art 2 (2) (b) (iv).
[62] Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.
[63] Ibid; see the title of art 29.
[64] Ibid art 29 (3)–(5).

restrict market access but are a condition to access financial support and count towards MSs' renewable energy targets,[65] and compliance is controlled by private certification schemes.[66]

Three novelties with relevance to this chapter were introduced. First, the directive's scope on biofuels and bioliquids was extended to biomass fuels too, defined as gaseous and solid fuels produced from biomass.[67] Second, the requirements on GHG emissions savings have been made more stringent and are increasing in line with the opening date of a facility. Third, it has to be noted that sustainability criteria only apply to biomass fuels used for producing electricity, heating and cooling or fuels from a certain installation size onwards, namely a total energy generation capacity of a rated thermal input of 20 megawatts (MW) for production from solid biomass and of 2 MW from gaseous biomass fuels.[68] This last point is of interest, given that current electrolysers for the production of green hydrogen are operating mostly at a similar scale (between a few MW to around 20 MW), which makes an analogy easy.

In October 2023, once again, a revised version of the RED was adopted. RED III amends and reshuffles the provisions detailing the GHG and sustainability criteria applicable to bioenergy and RFNBOs, strengthened some GHG reduction targets[69] and doubled the previous target for the share of renewable energy within the final consumption of energy in the transport sector to 29 per cent by 2030.[70] Yet no major change impacted the sustainability criteria, the sectors to which they apply, and so on.

In a nutshell, sustainability criteria in EU law tackle GHG emissions and (direct or indirect) land use change that impacts upon environmentally valuable types of land. These GHG emission reductions are a condition for bioenergy to qualify for financial support and to count towards renewable energy targets. They apply to both domestic production and imports and compliance is (mostly) checked by private certification bodies. However, issues such as soil, air and water quality and their usage or social aspects are not part of the criteria. These are merely subject to a reporting requirement.

10.2.3 *The Critique of Sustainability Criteria for Bioenergy in EU Law*

The critique of sustainability criteria for bioenergy in EU law mainly focuses on two dimensions: the environmental and the social spheres. Although several points of critique about the environmental impact of bioenergy on GHG emissions and on the local environment have been addressed with the legislative process leading to RED II and III, some persist. Three issues in particular remain, which will now be explained in more depth: first, the issue of green protectionism; second, the problem of non-carbon-related local environmental impacts; and third, problems with the certification process.

As far as the first point is concerned, it has been argued that the EU created the sustainability criteria to protect 'its own inefficient domestic biofuels production'.[71] These accusations amount to alleged green imperialism in the sense that EU institutions decide what is to be considered sustainable bioenergy and how the specific local ecological and social needs are to be balanced

[65] Ibid art 29 (1).
[66] Ibid art 30 (3).
[67] Ibid art 2 (27).
[68] Ibid art 29 (1).
[69] RED III, art 29 (a) (iii).
[70] Ibid art 25 (1) (a) (i).
[71] Stavros Afionis and Lindsay C Stringer, 'European Union leadership in biofuels regulation: Europe as a normative power?' (2012) 32 J Clean Prod 114, 114 (hereinafter: Afionis and Stringer).

with economic and social development interests in producing countries.[72] Using other terms, this is labelled as a transnational legal process, being the 'impact of unilateral legal developments in one jurisdiction that affect behaviour in others'.[73]

Second, many critics point out that sustainability criteria prioritize carbon concerns over non-carbon ones,[74] adopting 'a limited definition of sustainable development'.[75] Academics would like to see sustainability criteria extended to soil, water and air protection, to the restoration of degraded land and to the avoidance of excessive water consumption in areas where water is scarce.[76] As things stand, these are only subject to a reporting obligation to the Commission by private certification schemes.[77] Yet several studies show that reductions in GHG emissions from biofuels are achieved at the expense of other impacts, such as acidification, eutrophication, water footprint and biodiversity loss.[78] A 2013 study on the topic of air, soil and water protection acknowledged that introducing mandatory quantitative criteria is not feasible, given the wide variety of crops and the prevailing bio-physical, environmental and climatic conditions for producing bioenergy, and proposed instead to place greater emphasis on targeted management practices.[79] Such practices would require compliance with relevant legislation on soil, water and air, the creation of management plans at farm level for soil and water management and the creation of river basin management plans to identify regions at risk of water scarcity.[80] In the 2016 impact assessment for the preparation of RED II, the European Commission clearly indicated that, while the inclusion of these issues in the sustainability criteria was requested by stakeholders during the public consultation, it decided not to reopen the topic due to the industry complaining about the administrative burden that these additional criteria would bring about.[81] In addition, the Commission argued that many private certification schemes that it recognizes already require good agricultural practices, including for soil, water and air.[82]

Third, the private certification schemes that control compliance with the sustainability criteria have been widely criticized, as they allegedly amount to an externalization of the control of legal compliance to private parties. The literature describes this system as a hybrid approach,[83] which allows a formally voluntary certification system to become de facto mandatory through formal enshrinement in law.[84] The advantage is that some schemes are targeted to a particular feedstock and/or regional conditions and therefore have the specific expertise needed to define

[72] Emily Webster, 'Transnational legal processes, the EU and RED II: Strengthening the global governance of bioenergy' (2020) 29 RECIEL 86, 93–94.

[73] Ibid 87. See also Christian Gamborg, Helle Tegner Anker and Peter Sandøe, 'Ethical and legal challenges in bioenergy governance: Coping with value disagreement and regulatory complexity' (2014) 69 Energy Policy 326, 328 (hereinafter: Gamborg, Tegner Anker and Sandøe).

[74] See for instance, Gamborg, Tegner Anker and Sandøe 326.

[75] Laura Kemper and Lena Partzsch, 'A water sustainability framework for assessing biofuel certification schemes: Does European hybrid governance ensure sustainability of palm oil from Indonesia?' (2018) 192 J Clean Prod 835, 836 (hereinafter: Kemper and Partzsch).

[76] Ibid; Mai-Moulin et al 6.

[77] RED III, art 30 (4) and (5).

[78] Jeswani, Chilvers and Azapagic 1–2.

[79] ECOFYS, 'Report on mandatory requirements in relation to air, soil, or water protection: analysis of need and feasibility' (21 February 2013) 2 (hereinafter: ECOFYS).

[80] Ibid.

[81] European Commission, 'Commission Staff Working Document – Impact Assessment Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources' SWD(2016) 418 final, 36.

[82] Ibid Annex 10 (only available in the html version of the Impact Assessment).

[83] Gamborg, Tegner Anker and Sandøe 328; Kemper and Partzsch 837; Staricco and Buraschi 186.

[84] Staricco and Buraschi 193.

management requirements targeted at the local conditions.[85] It also allows bioenergy producers to choose a more ambitious certification scheme, with higher requirements than those in RED III.[86] Moreover, when non-governmental organizations (NGOs) are participating in certification schemes, research shows a strengthening of the criteria.[87] However, the literature also pointed to the risk of a 'race to the bottom' or 'forum shopping', where producers overwhelmingly choose the less demanding certification scheme, even when the final product is sold with an upper quality certificate.[88] The consequence is that to really improve the sustainability of bioenergy production, raising the 'meta-standard' is the safest option: sustainability criteria could integrate what is already being proposed by various certification schemes and make these elements mandatory.[89]

Besides this criticism on the environmental side of sustainability criteria, there is also long-standing dissatisfaction about the exclusion of social issues, which will be discussed now. The absence of the social dimension means that the negative effects of bioenergy production on social and human rights, such as 'appropriate wages and working conditions or land rights of smallholders and indigenous peoples', is often disregarded.[90]

Despite the absence of mandatory social requirements in EU law, many private certification schemes do integrate such prerequisites.[91] The situation is very similar to the one described above on the inclusion of non-carbon environmental aspects in private certification schemes. Indeed, some standards are quite comprehensive on the issue while others are very light,[92] and schemes with NGOs forming part of the board are more stringent in their criteria than industry-only ones.[93] Yet overall social criteria are usually less present than environmental ones in the certification schemes,[94] and they also suffer from a race to the bottom.[95] For these reasons, scholars are prone to request the inclusion of mandatory social sustainability criteria in EU law, for instance based on what many private schemes already propose,[96] to 'set the "bottom line" higher'.[97]

85 ECOFYS 3.

86 For instance, on the issue of water, research found that many schemes actually integrated monitoring and control criteria and indicators such as availability of water, accessibility, quality, identification and protection of existing formal and customary water rights. See Nidia Elizabeth Ramirez-Contreras and André PC Faaij, 'A review of key international biomass and bioenergy sustainability frameworks and certification systems and their application and implications in Colombia' (2018) 96 RSER 460, 467 (hereinafter: Ramirez-Contreras and Faaij); see also Mai-Moulin et al 10.

87 Kemper and Partzsch 836.

88 A study of Argentinean biodiesel production and export to the EU shows that while all exported biodiesel is certified (and the vast majority of it under a certification scheme that is more demanding than the bottom line), the actual standard used for the cultivation of the feedstock is the basic one, but then accounted as higher quality through 'a simple administrative procedure'. See Staricco and Buraschi 187–191. See also Sarah L Stattman and others, 'Toward sustainable biofuels in the European Union? Lessons from a decade of hybrid biofuel governance' (2018) 10(11) Sustainability 1, 3 (hereinafter: Stattman et al).

89 Kemper and Partzsch 842.

90 Afionis and Stringer 117.

91 Ramirez-Contreras and Faaij 473; Mai-Moulin et al 5.

92 Staricco and Buraschi 192; Laura German and George Schoneveld, 'A review of social sustainability considerations among EU-approved voluntary schemes for biofuels, with implications for rural livelihoods' (2012) 51 Energy Policy 765, 765 (hereinafter: German and Schoneveld).

93 Hans Morten Haugen, 'Coherence or forum shopping in biofuels sustainability schemes?' (2015) 33(1) Nord J Hum Rights 52, 52; Kemper and Partzsch 836.

94 Ramirez-Contreras and Faaij 472.

95 Stattman et al 8; Staricco and Buraschi 185.

96 Kemper and Partzsch 842; Stattman et al 13; Mai-Moulin et al 10; Jamie Konopacky, 'Refueling biofuel legislation: Incorporating social sustainability principles to protect land rights' (2012) 30(2) Wis Int Law J 401, 421 (hereinafter: Konopacky).

97 German and Schoneveld 776.

However, there is a large stumbling block on the way to this integration. When writing RED I, the European Parliament's Industry Committee proposed to include social aspects in the sustainability criteria.[98] Due to deep concerns about the compatibility with World Trade Organization (WTO) rules, raised by the Commission especially, this idea was abandoned.[99] Imposing mandatory social sustainability criteria was seen as overstepping 'some countries' "red lines" and thus would almost certainly trigger an action in the WTO'.[100] Most of the academic debate about the legal feasibility of social sustainability criteria with regard to WTO law took place during and shortly after the establishment of RED I and many scholars considered this option to be difficult.[101] However, there is some discrepancy and a few authors believe that it would be possible to include such criteria, especially based on the requirements that are already widely used in private certification schemes.[102]

Based on this section, one may consider that the EU sustainability criteria on bioenergy should more accurately be renamed 'environmental criteria' (without downplaying all the criticisms of the scope and control of the environmental aspects). Indeed, in contrast with what was mentioned in Section 10.2.1, while the use of the term sustainability criteria suggests an inclusion of the three pillars of sustainable development – economic, social and environmental – only the environmental one is part of the binding EU requirements applying to the production and import of sustainable bioenergy products.

10.3 TRANSPOSING SUSTAINABILITY CRITERIA FROM BIOENERGY TO HYDROGEN: ONE SIZE FITS ALL?

As mentioned in the Introduction to this chapter, EU law is in the process of transposing the bioenergy sustainability criteria to local production as well as imports of renewable hydrogen. This move avoids drafting specific sustainability criteria for hydrogen and circumvents time-consuming political negotiations both between EU MSs and with third parties. However, it relies on the assumptions that (i) bioenergy provisions can easily and clearly be applied to hydrogen, otherwise creating an issue in terms of intelligibility of the law, and that (ii) the potential sustainability impacts of renewable hydrogen production are like those created by the production of bioenergy to avoid a mismatch.[103]

Firstly, regarding the application of bioenergy provisions to hydrogen. As mentioned in the Introduction, the rGD proposal provides that articles 29, 29a and 30 of RED III, setting the sustainability criteria for bioenergy, apply to renewable gases.[104] Renewable gases encompass RFNBOs, which encompass renewable hydrogen. Hydrogen produced through the electrolysis

[98] Ibid 767; Taotao Yue, 'EU Regulation of the Sustainability of Biofuels' in *Different Paths towards Sustainable Biofuels? A Comparative Study of the International, EU, and Chinese Regulation of the Sustainability of Biofuels* (Intersentia, 2018) 95, 112; Jennifer Franco and others, 'Assumptions in the European Union biofuels policy: Frictions with experiences in Germany, Brazil and Mozambique' (2010) 37(4) J Peasant Stud 661, 668.

[99] Afionis and Stringer 117.

[100] Robert Ackrill and Adrian Kay, 'EU biofuels sustainability standards and certification systems – How to seek WTO-compatibility' (2011) 62(3) J Agric Econ 551, 560.

[101] Jeremy de Beer and Stuart J Smyth, 'International trade in biofuels: Legal and regulatory issues' (2012) 13(1) Estey Centre Journal of International Law and Trade Policy 131, 140.

[102] Konopacky 423–427. Or at least argue that the European Parliament restrained itself on the matter and that it is unsure whether the WTO would have rejected social criteria or not, see Carsten Daugbjerg and Alan Swinbank, 'Globalization and new policy concerns: The WTO and the EU's sustainability criteria for biofuels' (2015) 22(3) J Eur Public Policy 429, 442.

[103] The resulting rules would also apply to 'green' ammonia and methanol, when produced from renewable hydrogen.

[104] rGD proposal, art 8 (1).

of water and fed with electricity from renewable sources falls under this category and therefore the sustainability criteria, as detailed in Section 10.2.2, should apply to its production in the EU as well as its import, if this product is to benefit from subsidies and to count for the renewable energy targets of EU MSs. Therefore, the legal link between renewable gases in the rGD and the sustainability criteria in the RED is clear.

However, there is an interpretation issue with how to specifically apply the bioenergy sustainability criteria to hydrogen. For instance, article 29(3) RED III reads: 'Biofuels, bioliquids and biomass fuels produced from agricultural biomass … shall not be made from raw material obtained from land with a high biodiversity value.' If one simply replaces bioenergy with renewable gases in this provision, then it focuses on such gases being produced from agricultural biomass, which does not make much sense as renewable hydrogen will be produced with water and electricity overwhelmingly from hydropower, wind or solar power. In fact, the EU, in its common political agreement of 14 December 2023 on the new revised Gas Directive, only takes these two (wind and solar) into account for the production of renewable hydrogen and defines renewable hydrogen produced from biomass as biogas in recital 9 of the proposal.[105] Whether or not this is the end point and will find its way into the *Official Journal of the European Union* remains to be seen.

Coming back to article 29(3) RED III. If one considers that the whole provision part to be replaced with renewable gases is 'Biofuels, bioliquids and biomass fuels produced from agricultural biomass', then it would mean that hydrogen 'shall not be made from raw material obtained from land with a high biodiversity value'. It makes a bit more sense than the previous version but it is still not satisfactory.

Indeed, the raw material used for hydrogen is water. Taking a whole supply chain approach, one could also consider as raw materials the resources needed to construct wind turbines, solar panels or dams but these are difficult to trace and do not include the impacts during the operation of the renewable energy installation. A more coherent interpretation would require that the production of renewable gases does not harm land with high biodiversity value. In article 29(3), this means land that has or has had the status of primary forest, highly biodiverse forest, legally recognized protected natural areas, highly biodiverse grassland spanning more than one hectare, or heathland. In the case of renewable hydrogen, it may mean avoiding the electrolyser, the water source and the renewable energy installations being located within such areas. But this would probably be too restrictive, given that the impacts of electrolysers or water pumping or renewable energy installations do not systematically involve a change in (the whole) land use, as tends to be the case for bioenergy. Therefore, it may be necessary for the Commission to adopt more specific rules or at least a guideline to set a threshold above which it is considered that the land is too harmed for the renewable gas to be considered sustainable.

Secondly, unpacking the issue of the potential sustainability impacts of renewable hydrogen compared to bioenergy raises various points. The first is GHG emissions. Although renewable hydrogen is often perceived as emissions-free or with very low emissions, once the life cycle of electrolysers' and renewable energy installations' components is taken into account, hydrogen actually is 'an indirect greenhouse gas whose warming impact is both widely overlooked and

[105] Recital 9 of Council of the European Union Interinstitutional file 2021/0425(COD) Proposal for a Directive of the European Parliament and of the Council on common rules for the internal markets in renewable and natural gases and in hydrogen (recast) – Analysis of the final compromise text with a view to agreement <https://data.consilium.europa.eu/doc/document/ST-16516-2023-INIT/en/pdf> accessed 2 January 2024.

underestimated'.[106] It is essential that hydrogen leakage and venting are tracked and limited as much as possible, given that it is a similar GHG to methane: it lasts in the atmosphere a couple of decades but its 'indirect warming potency per unit mass is around 200 times that of carbon dioxide'.[107] In this regard, RED III sets a GHG savings criteria specifically for RFNBOs at 70 per cent.[108] The new regime between rGD and RED III is therefore consistent in this respect.

The other series of impacts where hydrogen has to be compared to bioenergy is the (direct or indirect) land use change that affects environmentally valuable types of land. As detailed in Section 10.2.2, bioenergy feedstock should not come from land with high biodiversity value, land with high carbon stock or peatlands. Such restrictions may be useful to avoid or limit some impacts of renewable hydrogen production. For instance, article 29 (3) (c) RED III might address the risks of biodiversity loss, especially from renewable energy installations, when located in areas designated by law or by the relevant competent authority for nature protection purposes, or for the protection of rare, threatened or endangered ecosystems or species.[109] However, this will (i) depend on the interpretation of the sustainability criteria in the case of hydrogen, as highlighted previously in this section, and (ii) only cover some impacts of the renewable hydrogen life cycle and not even the most important ones according to the literature, as detailed below.

Arguably, the first environmental concern when it comes to renewable hydrogen is the consumption of water. While water consumption to produce renewable hydrogen is minimal when compared to water consumption for other uses, such as farming,[110] it is still a prevalent local concern given the global hotspots for future renewable hydrogen production are usually water-scarce, with countries such as Chile, Morocco, Namibia or even for Global North countries Australia or Spain.[111] A solution to avoid conflicts around water supply could be to use desalinated water,[112] which only slightly increases the total electricity consumption and the final price,[113] or to directly use sea water, although the technology is not yet commercially available.[114] In any case, RED III's sustainability criteria only require reporting about the avoidance of excessive water consumption in areas where water is scarce,[115] not compulsory limits.

106 Ilissa B Ocko and Steven P Hamburg, 'Climate consequences of hydrogen emissions' (2022) 22 Atmos Chem Phys 9349, 9349.
107 Ibid 9350.
108 RED III, art 29a (1).
109 See for instance a hydrogen project in Argentina which plans to install between 400 and 1,600 wind turbines in a protected natural area (la meseta de Somoncurá), on the flightpath of condors. Claudia Olate, 'El impacto ambiental del proyecto de Hidrógeno Verde', *Agencia de Noticias Bariloche* (27 November 2022) <www.anbariloche.com.ar/noticias/2022/11/27/87659-el-impacto-ambiental-del-proyecto-de-hidrogeno-verde> accessed 22 February 2023.
110 Rebecca R Beswick, Alexandra M Oliveira and Yushan Yan, 'Does the green hydrogen economy have a water problem?' (2021) 6(9) ACS Energy Lett 3167, 3168 (hereinafter: Beswick, Oliveira and Yan); IEA, 'Global Hydrogen Review 2021' (2021) 109 <www.iea.org/reports/global-hydrogen-review-2021> accessed 11 December 2023.
111 Robert Lindner, 'Green hydrogen partnerships with the Global South. Advancing an energy justice perspective on "tomorrow's oil"' (2023) 31(2) Sustain Dev 1038 (hereinafter: Lindner); Aurora Energy Research, 'Renewable hydrogen imports could compete with EU production by 2030' (24 January 2023) <https://auroraer.com/media/renewable-hydrogen-imports-could-compete-with-eu-production-by-2030/> accessed 11 December 2023 (hereinafter: Aurora Energy Research); Hydrogen Council, 'Global hydrogen flows: Hydrogen trade as a key enabler for efficient decarbonisation' (October 2022) 12 and 19.
112 Lindner 8.
113 Beswick, Oliveira and Yan 3168; Pau Farràs, Peter Strasser and Alexander J Cowan, 'Water electrolysis: Direct from the sea or not to be?' (2021) 5(8) Joule 1921, 1922.
114 IEA 109; Fei-Yue Gao, Peng-Cheng Yu and Min-Rui Gao, 'Seawater electrolysis technologies for green hydrogen production: Challenges and opportunities' (2022) 36 Curr Opin Chem Eng 1.
115 See Section 10.2.2.

The second environmental concern when it comes to renewable hydrogen is the combination of all sorts of environmental impacts along the supply chain to produce renewable hydrogen, especially the impacts of mining for the electrolyser's materials as well as for the renewable energy installations,[116] and the impacts of the siting of the latter during construction and operating life.[117] These are indirect impacts, but they may be massive given the vast quantity of electricity necessary for the production and import of 20 million tonnes of hydrogen/year by 2030 according to European policy.[118] Some of these impacts may be countered in protected areas, as mentioned previously in this section, but all the impacts in non-protected areas may be ignored and renewable energy installations already have a history of local environmental impacts when poorly developed.[119] In such cases, the sustainability criteria should be broadened to ensure sustainable hydrogen production.

Finally, renewable hydrogen presents the risk of social impacts along its supply chain. Once more, the quantity of electricity to be produced from renewable sources implies a massive development in some countries foreseen as ideal renewable hydrogen suppliers to Europe, such as Morocco.[120] This can delay progress in access to electricity for local populations in some areas as well as the decarbonization of the country's electricity mix.[121] The need for such a quantity of large-scale projects also entails a high risk of negative social impacts, including poor labour practices, (indigenous) land grabbing and many types of human rights violations,[122] as here again shown by a history of social injustices created by poorly developed renewable energy installations.[123] Even though the inclusion of social sustainability criteria for bioenergy has been ruled out so far, mainly due to WTO law,[124] the inclusion of renewable hydrogen under this regime makes the case for this inclusion even more pressing.

Another possible interpretation of the application of RED III's sustainability criteria that strongly diverges from the developments in this section is to consider that as RED III's article 29 is entitled 'Sustainability and greenhouse gas emissions saving criteria for biofuels, bioliquids

[116] See Laura J Sonter and others, 'Renewable energy production will exacerbate mining threats to biodiversity' (2020) 11 Nat Commun 1.

[117] Floris Swennenhuis, Vincent de Gooyert and Heleen de Coninck, 'Towards a CO2-neutral steel industry: Justice aspects of CO2 capture and storage, biomass- and green hydrogen-based emission reductions' (2022) 88 ERSS 1, 5 (hereinafter: Swennenhuis, de Gooyert and de Coninck).

[118] For the policy target, see European Commission, 'Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions, REPowerEU Plan' SWD(2022) 230 final, 7. About the required electricity production, see Bauke Baumann, 'Green hydrogen from Morocco – no magic bullet for Europe's climate neutrality', Heinrich Boll Stiftung Brussels (9 February 2021) <https://eu.boell.org/en/2021/02/09/green-hydrogen-morocco-no-magic-bullet-europes-climate-neutrality> accessed 11 December 2023 (hereinafter: Baumann); Corporate Europe, 'Hydrogen from North Africa – a neocolonial resource grab: The reality of EU green hydrogen import plans' (17 May 2022) <https://corporateeurope.org/en/2022/05/hydrogen-north-africa-neocolonial-resource-grab> accessed 11 December 2023.

[119] Abidur Rahman, Omar Farrok and Md Mejbaul Haque, 'Environmental impact of renewable energy source based electrical power plants: Solar, wind, hydroelectric, biomass, geothermal, tidal, ocean, and osmotic' (2022) 161 RSER 1.

[120] Aurora Energy Research; Baumann.

[121] Swennenhuis, de Gooyert and de Coninck 5; Kevin J Dillman and Jukka Heinonen, 'A "just" hydrogen economy: A normative energy justice assessment of the hydrogen economy' (2022) 167 RSER 1, 5; Abdoulaye Ballo and others, 'Law and policy review on green hydrogen potential in ECOWAS countries' (2022) 15 Energies 1, 11.

[122] See for instance for Morocco, Lindner 9; and for Brazil, Christian Brannstrom and Adryane Gorayeb, 'Social challenges of green hydrogen in the Global South' Alternative Policy Solutions (26 July 2022) <https://aps.aucegypt.edu/en/articles/802/social-challenges-of-green-hydrogen-in-the-global-south> accessed 11 December 2023.

[123] Max Lacey-Barnacle, Rosie Robison and Chris Foulds, 'Energy justice in the developing world: A review of theoretical frameworks, key research themes and policy implications' (2020) 55 Energy Sustain Dev 122.

[124] See Section 10.2.3.

and biomass fuels', it explicitly excludes RFNBOs and would only apply to biogas (understood as a component of 'biomass fuels')[125] as per the writing of article 8 (1) and 2 (2) of the rGD. In this case, article 8 (1) could be criticized for its lack of clarity. In addition, specific sustainability criteria would have to be adopted at an unspecified date, leaving the sector in a limbo.

10.4 CONCLUSION

With the adoption in 2023 of RED III and the rGD, renewable hydrogen should now be subject to bioenergy's sustainability criteria provisions. It follows the same overall principles: applicable whether produced in the EU or imported and compulsory to get public support and to count towards MSs' renewable energy targets. Yet applying the bioenergy sustainability criteria one-on-one to renewable hydrogen creates some issues. While the legal linkage between rGD and RED III and the GHG emissions reductions is clear, the final interpretation of the application of the sustainability criteria related to land use remains vague. Looking at the content of these land use criteria, some of them appear useful to tackle some environmental impacts of the supply chain behind the production of renewable hydrogen, essentially when it takes place in protected natural areas. However, for developments outside these areas, for water consumption in water-scarce areas and for social impacts, the bioenergy sustainability criteria are unfit.

Actually, these loopholes in existing sustainability criteria also fail to address similar impacts from bioenergy, as long noted by academics and NGOs. As mentioned in Section 10.2.3, in 2016 the European Commission rejected the inclusion of some of these issues in the sustainability criteria due to the industry complaining about the administrative burden that these additional criteria would cause. Yet the case of renewable hydrogen adds more weight to these demands, even if they increase the administrative burden. Social issues must also be tackled. It was mentioned that WTO law is an obstacle, but some scholars think it would be possible to include such criteria, especially based on the requirements that are already widely used in private certification schemes.[126] Otherwise, the EU would have to negotiate bilateral agreements including social criteria with its anticipated main providers. In both environmental and social cases, low sustainability criteria threaten the long-term acceptance and therefore sufficient supply of renewable hydrogen to the EU.

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[125] RED II, art 2 (27). Unmodified by RED III.
[126] Konopacky 423–427.

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