Energy Biomass and Land Use Change in EU Law

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Abstract

The EU energy policy is an important EU policy whose measures can contribute to the goals of the Green Deal and Sustainable Development Goals. The key measure of the energy policy is the use of renewable sources of energy. One of them is also biomass cultivated on the agricultural and forestland. However, the biomass brings not only the benefits, such as replacement for fossil fuels, mitigation of climate change, reduction of air pollution, development of green infrastructure in municipalities, improving physical and mental human health, improvement of degraded soils and new role for abandoned lands but there is also fear of competition for land and water with crops for food and feed, increasing the market prices of food and land and threat to food security, destruction of forests and biodiversity in order to obtain additional land for growing biomass and releasing carbon from carbon-rich soil into the atmosphere. Therefore, if this biomass should contribute to the sustainable development, it should be grown and used sustainably. These requirements can only be achieved by legal regulation of their growing, processing and use based on sustainable criteria verified by scientific research. The aim of the paper is to examine whether the sustainable criteria for cultivating energy biomass on agricultural and forest land under EU legal regulations are sufficient to prevent threats to biomass cultivation for energy purposes, while also preserving the land and its biodiversity for future generations. To achieve this goal, it is necessary to explore the legislative framework of renewable sources and its development in the EU law. Moreover, it requires an interdisciplinary approach, i.e. knowledge of law and other scientific fields, such as agriculture, forestry, landscape engineering, environment, sustainable development, social science and energy industry. In conclusions, we endeavour to summarize the main problems of sustainability criteria defined in the EU legislation.

Keywords: *EU energy law, renewable energy sources, biomass, sustainable criteria, land use.*

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1. Introduction

The main source of energy has been wood since the beginning of humankind. Later, wood biomass has been replaced by fossil fuels which, however, have two fundamental disadvantages, their resources are exhaustible and non-renewable[5] and their use damages the environment, contributes to air pollution, environmental degradation and climate change.[6] With the aim to reduce the use of non-renewable natural resources and the dependency on their imports in the last several tens of year, EU policy makers have focused on a sustainable and circular bioeconomy,[7] which plays a key role in achieving the goals of sustainable development.[8] The concept of bioeconomy has been clustered under three major perspectives: the biotechnology vision, the bioresource vision and bioecology vision[9] but their common interest is focused on exploration and exploitation of bio-resources.[10] One of the bio-resources is also biomass of fast-growing plants usually called as bioenergy plants. "Bioenergy plants are central to climate mitigation strategies that utilize biogenic carbon, alongside the use of biomass for heat"[11] but their cultivation should consider a range of environmental, social and economic factors to ensure the sustainable development with the greatest benefits.[12] Therefore, the transition to bioenergy requires a holistic approach,[13] "balancing energy needs with environmental protection, and considering social and economic implications."[14] The bioenergy plants bring the benefits such as

[5] Jancy Garg et al., "Bioenergy Crops," in *Handbook of Energy Management in Agriculture*, ed. A. Rakshit, A. Biswas, D. Sarkar, V. S. Meena and R. Datta (Springer, 2023), 435.
[6] Antonio Zecca and Luca Chiari, "Fossil-fuel constraints on global warming," *Energy Policy* 38, no. 1 (2010): 1, https://doi.org/10.1016/j.enpol.2009.06.068.
Luca Chiari and Antonio Zecca, "Constraints of fossil fuels depletion on global warming projections," *Energy Policy* 39, no. 9 (2011): 5026–27, https:// doi.org/10.1016/j.enpol.2011.06.011.
[7] Maximilian Kardung et al., "Development of the Circular Bioeconomy: Drivers and Indicators," *Sustainability* 13, no. 1 (2021): 413, https://doi.org/10.3390/su13010413.
[8] Idiano D'Adamo et al., "Bioeconomy of Sustainability: Drivers, Opportunities and Policy Implications, "Sustainability 14, no. 1 (2022): 200, https://doi.org/10.3390/su14010200.
[9] Stefania Bracco et al., "Assessing the Contribution of Bioeconomy to the Total Economy: A Review of National Frameworks," *Sustainability* 10, no 6 (2018): 1698, https://doi.org/10.3390/su10061698.
[10] Markus M. Bugge et al., "What is the bioeconomy? A review of the literature, "Sustainability 8, no. 7 (2016): 691, https://doi.org/10.3390/su8070691.
[11] Gail Taylor et al., "Sustainable bioenergy for climate mitigation: developing drought-tolerant trees and grasses," *Annals of Botany* 124, no 4 (2019): 513-14, https://doi.org/10.1093/aob/mcz146.
[12] Panayiotis Lymtsioulis et al., "Fast Growing Cultivated Trees for Energy Production and other Essential – Chemical Uses," *International Journal of Emerging Technology and Advanced Engineering* 8, no. 10 (2018): 44.
[13] Renske A. Giljam, "Towards a holistic approach in EU biomass regulation," *Journal of Environmental law* 28, no. 1 (2016): 95-6, https://doi.org/10.1093/jel/eqv025.
[14] Rafael Cardodo Rial, "Biofuels versus climate change: Exploring potentials and challenges in the energy transition," *Renewable and Sustainable Energy Reviews* 196, no. 1 (2024): 114369, https://doi.org/10.

climate change,[15] biodiversity conservation,[16] green infrastructure in municipalities, carbon sequestration, reduction of air pollution or restoration of ecological balance; however, they bring the challenges such as the competition for land and water with other food crops and food security,[17] invasion of exotic species and the spread of wildlife-related diseases,[18] instability of their market, less economic incentives to their produce and transport and other socioeconomic impacts and impacts on other ecosystem services.[19] The bioenergy plants could be a solution for degraded soils[20] and abandoned lands.[21] "Effective agricultural land abandonment in the EU-27 might total 5 million ha by 2030, or 2,9 % of the current Utilised Agricultural Area (173 million ha)."[22] Just the bioenergy plants could be an important and useful alternative abandoned land use option. There is common agreement of experts from different fields of study and politicians that bioenergy plants have the potential to contribute to the solution of above-mentioned issues, but only when biomass is produced sustainably[23] and the energy

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1016/j.rser.2024.114369.

[15] Joaquín Alaejos et al., "Biomass Production and Quality of Twelve Fast-Growing Tree Taxa in Short Rotation under Mediterranean Climate," *Forests* 14, no. 6 (2023): 1156. https://doi.org/10.3390/f14061156.

[16] Andrea Camia et al., *The use of woody biomass for energy purposes in the EU* (Publications Office of the European Union, 2021), 5.

[17] Yogeeswari Subramaniam et al., "The impact of biofuels on food security," *International Economics* 160, no. 1 (2019): 72-3, https://doi.org/10.1016/j.inteco.2019.10.003.
Yogeeswari Subramaniam et al., "Biofuels, environmental sustainability, and food security: A review of 51 countries," *Energy Research & Social Science* 68, no. 1 (2020): 101549, https://doi.org/10.1016/j.erss.2020.101549.

[18] Luciano M. Verdade et al., "Biofuels and biodiversity: Challenges and opportunities," *Environmental Development* 15, no. 1 (2015): 64, https://doi.org/10.1016/j.envdev.2015.05.003.

[19] Jancy Garg et al., "Bioenergy Crops," in *Handbook of Energy Management in Agriculture*, ed. A. Rakshit, A. Biswas, D. Sarkar, V. S. Meena and R. Datta (Springer, 2023), 437; Desirée J. Immerzeel et al., "Biodiversity impacts of bioenergy crop production: a state-of-the-art review, "*GCB Bioenergy* 6, no. 1 (2013): 184, https://doi.org/10.1111/gcbb.12067.

[20] Manuel Fernández et al., "Short rotation coppice of leguminous tree Leucaena spp. improves soil fertility while producing high biomass yields in Mediterranean environment," *Industrial Crops and Products* 157, no. 1 (2020): 112911, https://doi.org/10.1016/j.indcrop.2020.112911; Luciano M. Verdade et al., "Biofuels and biodiversity: Challenges and opportunities," *Environmental Development* 15, no. 1 (2015): 64-5, https://doi.org/10.1016/j.envdev.2015.05.003.

[21] Joaquín Alaejos et al., "Biomass Production and Quality of Twelve Fast-Growing Tree Taxa in Short Rotation under Mediterranean Climate," *Forests* 14, no. 6 (2023): 1156. https://doi.org/10.3390/f14061156.

[22] Bernd Schuh et al., *Research for AGRI Committee – The challenge of land abandonment after 2020 and options for mitigating measures* (Policy Department for Structural and Cohesion Policies, 2020), 13.

[23] Andrea Camia et al., *The use of woody biomass for energy purposes in the EU* (Publications Office of the European Union, 2021), 7. "EU Sustainability Criteria for Bioenergy," European Parliament, accessed January 8, 2025, http://www.europarl.europa.eu/RegData/etudes/BRIE/2017/608660/EPRS_BRI(2017)608660_EN.pdf; Marc Londo and Ewout Deurwaarder, "Developments in eu biofuels policy related to sustainability issues: overview and outlook," *Biofuels, Bioproducts & Biorefining* 1, no. 4 (2007): 292–93, https://doi.org/10.1002/bbb.40; Alexandra Purkus et al., "The Role of a Renewable Energy Target for the Transport Sector Beyond 2020: Lessons Learned from EU Biofuel Policy," in *The European Dimension of Germany's Energy Transition*, ed. E., Gawel, S. Strunz, P. Lehmann and A. Purkus (Springer, 2019), 527; Sarah L. Stattman et al., "Toward Sustainable Biofuels in the European Union? Lessons from a decade of hybrid biofuel governance," *Sustainability* 10, vol. 11 (2018): 4111, https://doi.org/10.3390/su101141

transition requires a legal system that promotes the most sustainable forms of energy.[24] The criteria of sustainability seem to be the most important in receiving the positive effects of bioenergy plants. Therefore, the European Union has revised the directive on renewable energy sources from 2009 and has extended the criteria of sustainability in the new directive from 2018 to include biomass for heat and electricity production in addition to biofuels for transport and bioliquids.[25] However, there is still not consensus on definition of sustainability.[26] It confirmed also the Joint Research Centre of the European Commission meaning of "sustainable" is depended on the differences in the ethical values regarding the interaction between humans and nature.[27] The definition of the World Commission on Environment and Development published in the Our Common Future is usually accepted: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[28] The goals balance the three dimensions of sustainable development: economic, social and environmental.[29] The definition include a universal concept of sustainability that must be elaborated in detail in individual areas of the economy including bioenergy. However, the sustainable bioenergy production should be based on rigorous assessments that integrate socioeconomic and environmental objectives at local, regional, and global scales.[30] There are usually positive global impacts on the reduction of greenhouse gasses emissions; however, regional and local impacts should be identified and monitored in order to be mitigated.[31] The impact of bioenergy policies may differ depending on national and local conditions and on the decision to utilize specific technologies and feedstock.[32] The aim of the paper is to examine whether the

11; Robert Bailis and Jennifer Baka, "Constructing Sustainable Biofuels: Governance of the Emerging Biofuel Economy," *Annals of the Association of American Geographers* 101, vol. 4 (2011): 827–28, https://doi. org/10.1080/00045608.2011.568867; Gustavo de L. T. Oliveira et al., "How biofuel policies backfire: misguided goals, inefficient mechanisms, and political-ecological blind spots," Energy Policy 108, vol. 1 (2017): 765, https://doi.org/10.1016/j.enpol.2017.03.036.

[24] Renske A. Giljam, "Towards a holistic approach in EU biomass regulation," *Journal of Environmental law* 28, no. 1 (2016): 97–8, https://doi.org/10.1093/jel/eqv025.

[25] "Sustainable and optimal use of biomass for energy in the EU beyond 2020. Final report," European Commission, accessed January 10, 2025, https://energy.ec.europa.eu/publications/sustainable-and-optimal-use-biomass-energy-eu-beyond-2020_en.

[26] Renske A. Giljam, "Towards a holistic approach in EU biomass regulation," *Journal of Environmental law* 28, no. 1 (2016): 95–124, https://doi.org/10.1093/jel/eqv025; Andrea Camia et al., *The use of woody biomass for energy purposes in the EU* (Publications Office of the European Union, 2021), 6.

[27] Andrea Camia et al., *The use of woody biomass for energy purposes in the EU* (Publications Office of the European Union, 2021), 7.

[28] "Report of the World Commission on Environment and Development: Our Common Future," World Commission on Environment and Development, accessed January 8, 2025, https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf.

[29] „Transforming our world: The 2030 Agenda for sustainable development," United Nations, accessed February 25, 2025, https://www.un.org/sustainabledevelopment/development-agenda/.

[30] Diego F. Correa et al., "Towards the implementation of sustainable biofuel production systems," *Renewable and Sustainable Energy Reviews* 107, no. 1 (2019): 250, https://doi.org/10.1016/j.rser.2019.03.005.

[31] Luciano M. Verdade et al., "Biofuels and biodiversity: Challenges and opportunities," Environmental Development 15, no. 1 (2015): 64-5, https://doi.org/10.1016/j.envdev.2015.05.003.

[32] Kateryna Melykh and Sudhir Jha, "Regulation of biomass production in EU from global socio-economic

sustainable criteria for cultivating energy biomass on agricultural and forest land under EU legal regulations are sufficient to prevent threats to biomass cultivation for energy purposes, while also preserving the land and its biodiversity for future generations. To achieve this goal, it is necessary to explore the legislative framework for renewable energy sources and its development within EU law, as well as the legislative definitions of key terms to renewable sources and determine whether the key concepts correspond to the scope of this legislative framework.

2. Energy Policy in EU Primary Law

EU primary law contained a mention of energy policy for the first time in the Maastricht Treaty 1993. The article 3 letter t) [33] of Treaty establishing the European Economic Community adopted by the Maastricht Treaty stated that the activities of the European Community include *measures in the spheres of energy*. According to the article 130s of the Maastricht Treaty under the title XVI called Environment[34] the Council, acting unanimously, was entitled to adopt *measures significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply* to achieve the objectives of environmental policy.[35] The separate EU energy policy was established by the Lisbon Treaty of 2009 in article 194 of the Treaty on the Functioning of the EU (hereinafter as TFEU) within the EU's internal activities and policies. This was preceded by the preparation of the Green Paper of the European Commission called *A European Strategy for Sustainable, Competitive and Secure Energy.*[36] The paper has already defined three fundamental objectives - competitiveness, sustainability and security - transformed into six priority areas such as completing the internal electricity and gas market; solidarity between Member States; more sustainable, efficient and diverse energy mix; tackling climate change; encouraging innovation and coherent external energy policy. The most of these priorities were incorporated in Article 194 of the TFEU.

Until the Lisbon Treaty, secondary legislation on energy was generally adopted based on provisions on trans-European networks[37] or on the environment,[38] or provisions on the approximation of the laws of the Member States.[39] There is still possible to use as a legislative basic also these articles, mainly article 114 and 115 TFEU

perspective," *IJONESS* 4, vol. 2 (2016): 71, https://doi.org/10.5604/01.3001.0010.3907.

[33] Later the article 3 letter u) of Treaty of EC renumbered by the Amsterdam Treaty.

[34] Article 175 of the title XIX Environment of the Treaty of the European Community (TEC) after the first renumbering of the EU primary law by the Amsterdam Treaty and article 192 of the title XX Environment of the Treaty of the functioning of the EU (TFEU) after the second renumbering of the EU primary law by the Lisbon Treaty.

[35] Defined in the article 130r of this title, later as Article 174 of TEC and now as article 191 of TFEU.

[36] „Green Paper. A Euroepan Strategy for Sustainable, Competitive and Secure Energy," European Commission, COM (2006) 105 final from 8th March 2006, accessed January 24, 2025, https://europa.eu/documents/comm/green_papers/pdf/com2006_105_en.pdf.

[37] Art. 170 TFEU (before art. 154 Treaty on EC).

[38] Art. 191 and 192 TFEU (before art. 174 and 175 Treaty on EC).

[39] Art. 114 and 115 TFEU (before art. 95 and 94 Treaty on EC).

on the approximation; however, since the energy sector is regulated in a separate title, secondary legislation on energy should preferably be based on new article 194 TFEU. Currently, this article should provide the legal basis for the adoption of secondary legislation on energy. Only exceptionally, in sensitive areas relating to fiscal policy, is it possible to use the special legislative procedure.

The Lisbon Treaty explicitly included competencies in energy policy among the shared competence of the EU and the Member States[40] in accordance with the principle of subsidiarity.[41] According to Article 194(1) TFEU, *in the context of the establishment and functioning of the internal market and with regard for the need to preserve and improve the environment, Union policy on energy shall aim, in a spirit of solidarity between Member States, to:*

a) ensure the functioning of the energy market;

b) ensure security of energy supply in the Union;

c) promote energy efficiency and energy saving and the development of new and renewable forms of energy; and

d) promote the interconnection of energy networks.

The cited provision implies three important facts. First, energy sector as one of the EU internal policies is part of EU internal market and therefore is governed by the rules of the internal market, mainly the rules of free movement of goods[42] with the possibility to justify a restriction on grounds of Article 36 TFEU[43] and the rules of economic competition.

Second, energy policy should be performed by measures that *preserve and improve the environment*. This part of article seems to be redundant because art. 11 TFEU requests that all policies apply measures protecting the environment.[44] It follows from the above that environmental policy alone cannot ensure adequate environmental protection, and it is necessary to promote environmental protection requirements through all internal EU policies, including energy policy. This section not only recalls the context of Article 11 TFEU but also emphasizes that energy policy is one of the policies with the greatest impact on the environment. In addition, the provisions on energy were originally linked to environmental protection in the common articles within one title of Treaty establishing the European Community. This is also related to one of the fundamental objectives of energy policy, namely sustainability. According to this objective, the EU *might be to aim for a minimum level of the overall EU energy mix*

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[40] Art. 4 TFEU.

[41] Art. 5 of the Treaty on European Union (TEU) and Protocol No. 2 on the application of the principles of subsidiarity and proportionality annexed to the TEU and the TFEU.

[42] Judgment of the Court of 15 July 1964. Case 6-64. Flaminio Costa v E.N.E.L. Reference for a preliminary ruling: Giudice conciliatore di Milano – Italy.

[43] Judgment of the Court of 10 July 1984. Case 72/83. Campus Oil Limited and others v Minister for Industry and Energy and others. Reference for a preliminary ruling: High Court - Ireland. Free movements of goods - Supply of petroleum products.

[44] Art. 11 TFEU: *Environmental protection requirements must be integrated into the definition and implementation of the Union's policies and activities, in particular with a view to promoting sustainable development.*

originating from secure and low-carbon energy sources.[45]

Despite all these facts (article 11 TFEU, EU energy policy as a part of internal market) and the apparent redundancy of the environmental protection provisions in Article 194 TFEU, the General Court argues in its ruling that *the Commission is not required to take account of environmental rules, when assessing an aid measure which does not pursue an environmental objective.*[46] However, aid measures fall under the provisions of economic competition, the rules of which are a fundamental basis for the functioning of the internal market. Energy policy is part of the internal market, as explicitly stated in Article 194 TFEU. The General Court added that *although it must be integrated into the definition and implementation of EU policies, particularly those which have the aim of establishing the internal market (Article 11 TFEU; …C-176/03, paragraph 42*[47]*…), protection of the environment does not constitute, per se, one of the components of that internal market, defined as an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured (Article 26(2) TFEU).*[48] The General Court explained that *it is clear from the wording of the above-mentioned case-law, which broadened the scope of the Commission's review in the context of State aid procedures beyond the verification of compliance with Article 107 TFEU, and in particular with the third paragraph of that article, to include the verification of consistency between State aid rules and specific provisions of EU law, that the courts of the European Union limit to those rules capable of having a negative impact on the internal market the rules other than those relating to State aid to which compliance must be verified*.[49] In other words, the General Court stated that only those provisions, other than those regulating state aid, whose compliance must be checked, are the ones capable of having a negative impact on the internal market, or those *relevant provisions which are not, strictly speaking, covered by the law on aid only where certain aspects of the aid in issue are so closely linked to its object that any failure on their part to comply with those provisions would necessarily affect the compatibility of the aid with the common market*.[50] The Court of Justice of the EU

[45] "Green Paper. A European Strategy for Sustainable, Competitive and Secure Energy," European Commission, COM (2006) 105 final from 8th March 2006, accessed January 24, 2025, https://europa.eu/documents/comm/green_papers/pdf/com2006_105_en.pdf.

[46] Judgment of the General Court (Second Chamber), 3 December 2014. Case T-57/11. Castelnou Energía, SL v European Commission, paragraph189.

[47] Judgment of the Court (Grand Chamber) of 13 September 2005. Case C-176/03. Commission of the European Communities v Council of the European Union. Action for annulment - Articles 29 EU, 31(e) EU, 34 EU and 47 EU - Framework Decision 2003/80/JHA - Protection of the environment - Criminal penalties - Community competence - Legal basis - Article 175 EC, paragraph 42: *Furthermore, in the words of Article 6 EC '[e]nvironmental protection requirements must be integrated into the definition and implementation of the Community policies and activities', a provision which emphasises the fundamental nature of that objective and its extension across the range of those policies and activities.*

[48] Judgment of the General Court (Second Chamber), 3 December 2014. Case T-57/11. Castelnou Energía, SL v European Commission, paragraph 189.

[49] Judgment of the General Court (Second Chamber), 3 December 2014. Case T-57/11. Castelnou Energía, SL v European Commission, paragraph 189.

[50] Judgment of the Court of First Instance (Third Chamber, extended composition) of 12 February 2008. Case T-289/03. British United Provident Association Ltd (BUPA), BUPA Insurance Ltd and BUPA Ireland Ltd v Commission of the European Communities, paragraph 314.

prejudiced this obligation of the Commission when it stated *that those aspects of aid which contravene specific provisions of the Treaty other than Articles 92 and 93* (Articles 107 and 108 TFEU - author's note *) may be so indissolubly linked to the object of the aid that it is impossible to evaluate them separately*.[51] The cited case law raises the question of the relevance of Article 11 TFEU and the environmental protection provisions in Article 194 TFEU if energy policy is to be part of the internal market, whose functioning based on the rules of economic competition, which do not always consider environmental protection. The consistency of the legal norms within EU primary law and the judgments of the Court of Justice of the European Union is clearly lacking in this regard.

Third, *a spirit of solidarity between Member States* is especially relevant today, when there is a threat of blackouts from third countries. This enhances security of supply in the internal market, calls for a rethinking of the EU's approach to emergency oil and gas stocks, and aims at preventing disruptions[52] while strengthening the position of Member States through cooperation with third countries.[53]

The first two main objectives in the energy policy - ensuring a functioning energy market and the security of energy supply in the EU - are complemented by a third objective focused on energy efficiency and energy saving, with contributions from new and renewable energy sources. These sources represent a means to reduce the EU's energy dependence on third countries and mitigate climate change.[54] These objectives are complemented by a fourth one, which emphasizes the need to modernize the existing energy infrastructure and develop new energy connections between Member States.[55] However, the Member States still have the right *to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply, without prejudice to Article 192(2)(c)*.[56] Such an express definition of competences by Member States in primary law is rare. This suggests that Member States consider these three competences in the field of energy to be strategic from the perspective of their internal security. However, the addendum to the cited article emphasizes that the provision on *measures significantly affecting a Member State's choice between different energy sources and the general structure of its energy supply*, which was introduced prior to the adoption of the Lisbon Treaty, remains in force. It introduces some degree of legal uncertainty to this provision. Under Article 192(2)(c) TFEU, the EU has the right to adopt these measures by special legislative procedure within the framework of environment policy. Through environmental measures aimed at combating climate change and fulfilling international commitments,

[51] Judgment of the Court of 15 June 1993. Case C-225/91. Matra SA v Commission of the European Communities. State aid - Complaint by a competitor - Failure to initiate the investigation procedure - Action for annulment, paragraph 41 and the case law cited therein.

[52] "Green Paper. A European Strategy for Sustainable, Competitive and Secure Energy," European Commission, COM (2006) 105 final from 8th March 2006, accessed January 24, 2025, https://europa.eu/documents/comm/green_papers/pdf/com2006_105_en.pdf.

[53] Jindřiška Syllová et al., *Lisabon Treaty. Commentary* (C.H.Beck Praha, 2010), 700-701.

[54] Jindřiška Syllová et al., *Lisabon Treaty. Commentary* (C.H.Beck Praha, 2010), 703.

[55] Jindřiška Syllová et al., *Lisabon Treaty. Commentary* (C.H.Beck Praha, 2010), 705.

[56] Art. 194 (2) TFEU.

the EU—albeit indirectly—intervenes in the competence that Member States have reserved for themselves under Article 194 TFEU. This is particularly evident in the imposition of obligations on Member States regarding emission reductions and the share of renewable energy sources in EU secondary law.

The EU strategic plan in the field of climate change - the European Green Deal[57] - aims to make Europe the climate-neutral continent by 2050. Therefore, the Member States will only be allowed to emit as much CO_2 as carbon sinks will be able to absorb. This objective will significantly impact Member States' decisions regarding the structure of their energy sources, with a priority on the use of renewable energy sources. An example is also the directive 2023/1791[58] which obliges Member States to *ensure that regional and local authorities establish specific energy efficiency measures in their long-term planning tools, such as decarbonisation or sustainable energy plans.*[59] As a part of energy plans, the directive recommends the following technologies for heating and cooling: industrial waste heat and cold; waste incineration; high efficiency cogeneration; renewable energy sources, such as geothermal, solar thermal and biomass, other than those used for high efficiency cogeneration; heat pumps; reducing heat and cold losses from existing district networks; and district heating and cooling.[60] The Member States are free to choose the relevant technologies but their choice is limited to renewable energy sources. The national energy and climate plans should include national objectives for each of the five dimensions of the Energy Union. These dimensions, such as the decarbonisation, energy efficiency, energy security, internal energy market, research, innovation and competitiveness were stipulated by the Regulation 2018/1999.[61] To develop energy plans in accordance with the requirements of these EU secondary acts it is necessary to give up one's own idea of *choice between different energy sources and the general structure of its energy supply*.

The EU primary law establishes foundational principles for energy governance, including sustainability, security and competitiveness. Conversely, EU secondary law within the framework of European Union energy policy is essential for comprehending the management and regulation of renewable energy sources. EU secondary law operationalizes these principles through specific regulations and directives that address various dimensions of energy production and consumption. Since EU has set ambitious sustainability targets, including the European Green Deal and commitments to the Paris

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[57] "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. The European Green Deal," European Commission COM/2019/640 final, accessed January 8, 2025, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640.

[58] Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955, OJ L 231, 20.9.2023.

[59] Article 5 (6) of the Directive 2023/1791. The article should be transposed by October 11, 2025.

[60] Annex X of Directive 2023/1791.

[61] Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council, OJ L 328, 21.12.2018.

Agreement, biomass energy is positioned as a renewable energy source that can significantly contribute to these goals. A significant focus within this regulatory framework is biomass energy and its associated land use change.

3. The Development of EU Secondary Law Related to Renewable Energy Sources

One of the main objectives of energy policy defined in Article 194 TFEU is to promote and develop new and renewable forms of energy. However, before the first Renewable Energy Sources Directive was adopted, the EU began supporting biomass as a renewable source by promoting the cultivation of crops for non-food purposes in the 1990s. But the initial motivation was to manage agricultural surpluses rather than to promote environmental protection. Consequently, the first legislative rules on cultivating biomass for the energy sector were included in the Common Agricultural Policy.[62] In addition, the issue of renewable sources appeared in political documents, such as the White Paper on renewable energy sources[63] or the Council Resolution of 8 June 1998 on renewable energy sources.[64] Topics such as climate change and energy security only gained relevance at the turn of the millennium. In 2001, the Directive on the promotion of electricity production from renewable sources and in 2003, the Directive on the promotion of the use of biofuels and other renewable fuels in transport were adopted. The legal basis for these directives was Article 175 of the Treaty establishing the European Community,[65] which pertains to environmental policy.

The first directive on renewable resources[66] was a response to the EU's commitments under the Kyoto Protocol.[67] Promoting energy production from renewable sources became one of the EU's priorities for reasons of energy security, diversity of energy supply, environmental protection, and, ultimately, social and economic cohesion.[68] The Directive provided legal definitions for the term "renewable sources," which referred to *renewable non-fossil energy sources (wind, solar, geothermal, wave, tidal, hydropower, biomass, landfill gas, sewage treatment plant gas*

[62] Juan J. Cadillo-Benalcazar et al., "Why does the European Union produce biofuels? Examining consistency and plausibility in prevailing narratives with quantitative storytelling," *Energy Research & Social Science* 71, no. 1(2021): 101810, https://doi.org/10.1016/j.erss.2020.101810.
[63] "Communication from the Commission *Energy for the Future: Renewable Sources of Energy* White Paper for a Community Strategy and Action Plan," European Commission COM(97)599 final, accessed January 8, 2025, https://europa.eu/documents/comm/white_papers/pdf/com97_599_en.pdf.
[64] Council Resolution of 8 June 1998 on renewable sources of energy, OJ 98/C198/01, 24 June 1998.
[65] Now Article 192 TFEU.
[66] Directive 2001/77/EC of the European Parliament and of the Council on the promotion of electricity produced from renewable energy sources in the internal electricity market.
[67] Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder, OJ L 130, 15.5.2002.
[68] Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market, OJ L 283, 27.10.2001, preamble, paragraph 2.

and biogases).[69] The listing of renewable energy sources in the legal definition appears to be exhaustive. However, as the development of renewable energy sources progresses alongside advances in science and technology, the definition should allow for the inclusion of new renewable energy sources in achieving the objectives set by secondary EU law. Nevertheless, it can be implicitly inferred from the definition that the term "renewable energy sources" includes any energy source that is not a fossil fuel, while the sources listed in brackets serve only as an illustrative enumeration. However, in the interest of legal certainty, it would be preferable to explicitly state that this is merely an illustrative list that may be expanded in accordance with advancements in scientific and technical knowledge in the field of renewable energy sources. This is even more relevant because the definition of biomass raises doubts in practice regarding what can be included under the term "biomass." Biomass is defined as the *biodegradable fractions of products, waste, and residues from agriculture (including vegetal and animal substances), forestry, and related industries, as well as the biodegradable fraction of industrial and municipal waste.*[70] This means that only biodegradable waste, residues, and fractions of products from agriculture, industry, and households can be considered sources of biomass. There is a question as to whether energy crops and woody plants can be included in this definition. They could be considered as biodegradable fractions of products; however, energy crops and woody plants are not mentioned anywhere in the Directive. Therefore, we are interested in the further development of the legal definitions of key terms, including biomass.

Few years later, the second directive[71] was adopted. It aimed to achieve objectives such as *meeting climate change commitments, environmentally friendly security of supply and promoting renewable energy sources.*[72] The Directive included a legal definition of biomass, which was identical to the one provided in Directive 2001/77/EC. However, in this Directive, Article 4(2)(d) at least mentions that the Commission's assessment report must also include the sustainability of crops used for biofuel production. From the above, it implicitly follows that the definition of biomass also includes energy crops. Because of legal certainty, it would be helpful to explicitly include energy crops in the definition of biomass, specifying whether the term applies to all energy crops or only those that are not intended for food and feed production (such as energy trees). In other words, it should be clarified whether the definition of biomass applies only to so-called second-generation or third-generation biofuel sources, or also to first-generation biofuel sources.

The definition of renewable sources was not explicitly provided but instead referred to the definition in Directive 2001/77/EC. The key definitions of this directive were terms such as "biofuels," *which means liquid or gaseous fuel for transport produced from biomass*[73] and "other renewable fuels*"* defined as *means renewable*

[69] Article 2(a) of Directive 2001/77/EC.
[70] Article 2(b) of Directive 2001/77/EC.
[71] The Directive of the European Parliament and of the Council 2003/30/EC on the promotion of the use of biofuels or other renewable fuels for transport.
[72] Article 1 of Directive 2003/30/EC.
[73] Article 2(1)(a) Directive 2003/30/EC.

fuels, other than biofuels, which originate from renewable energy sources (...) and used for transport purposes.[74] By introducing new concepts based on the definitions of renewable energy sources and biomass in the original directive, the European legislator missed the opportunity to broaden the scope for including new renewable energy and biomass sources.

None of the above directives included sustainability criteria for producing, distributing, or consuming electricity from renewable sources, as well as biofuels and other fuels derived from renewable energy sources. Only the directive on fuels promotes the use of biofuels in accordance with sustainable farming and forestry practices, but these should also be included in the rules of the Common Agricultural Policy. Moreover, the target for the minimum proportion of biofuels and other renewable fuels to be placed on the market in the Member States shall be 5.75% of all petrol and diesel used for transport purposes by 31 December 2010. However, the EU and the Member States failed to meet this target. To unify terminology, address the significant differences between Member States in achieving the targets, and respond to the European Council's invitation from March 2007[75] to propose a comprehensive directive on the use of all renewable energy resources with sustainable bioenergy criteria, the European Commission decided to draft new legislation regulating the use of energy from renewable sources across all sectors of the national economy. In 2009, the new directive was adopted based on Article 175 TEC,[76] the directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. The Directive establishes common rules for the use of energy from renewable sources in Member States, aiming to reduce greenhouse gas emissions, promote energy-efficient technologies, and utilize renewable energy as an effective tool for ensuring energy security. Moreover, the preamble of the directive emphasizes that the requirements for a sustainability scheme for the energy use of biomass, other than bioliquids and biofuels, should be analysed by the Commission in 2009, considering the need to manage biomass resources sustainably.[77] It follows from the above that the directive focuses on achieving goals in the area of greenhouse gas reduction and, consequently, on mitigating climate change. However, it did not address the sustainability of renewable resources from a holistic approach.

The overall objective of the directive was to achieve a 20% share of energy from renewable sources in the EU's total energy consumption by 2020 and a minimum share of 10% for biofuels in total transport fuel consumption, provided that this target is achieved by all Member States in a cost-effective manner.[78] However, it seems that

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[74] Article 2(1)(c) Directive 2003/30/EC.

[75] "Presidency conclusions - Brussels," Council of the EU 8/9 March 2007, accessed January 8, 2025, https://data.consilium.europa.eu/doc/document/ST%207224%202007%20REV%201/EN/pdf.

[76] Now Article 192 TFEU because the Lisbon Treaty entered into force on 1 December 2009. This directive was published in the Official Journal on 5 June 2009.

[77] 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, OJ L 140, 5.6.2009, preamble, paragraph 75.

[78] Directive 2009/28/EC, preamble, paragraphs 9- 13.

these targets were set without any prior assessment of their sustainability. The European Council's statement at its 2008 meeting shows that when these targets were introduced, the impact of biofuel production on agricultural and food products, as well as the environmental and social consequences of biofuel production and consumption, were not yet known.[79] Therefore, this legislative step cannot be viewed positively; the adoption of such significant measures for all Member States should have been preceded by a thorough scientific analysis of the impacts, which would have always been more cost-effective than addressing the consequences of politically unfounded decisions. "A responsible process of policy making should not be based on the coupling of targets with justification narratives. Instead, the focus should be on the congruence between justification narratives (what the concerns are to be addressed) and normative narratives (the identification of what should be done) based on plausible explanations."[80]

Directive 2009/28/EC did not introduce significant changes to the definitions of the key terms. There were only minor corrections and more detailed specifications in the definitions. The Directive practically adopted the legal definition of biomass from the previous ones, specifying that agricultural residues must be of biological origin and explicitly stating that fisheries and aquaculture are also considered related sectors.[81] Even the new legislation did not provide clarification whether the definition of biomass includes energy wood plants. Only the Annex V Part B of the Directive indicates that energy wood plants are included when future biofuels should be considered "farmed wood ethanol," "farmed wood methanol" and other biofuels from farmed wood.

The term of renewable energy sources was slightly changed which means *energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases.*[82] The enumeration was supplemented with aerothermal (*energy stored in the form of heat in the ambient air*)[83] and hydrothermal energy (*energy stored in the form of heat in surface water*).[84] Moreover, the wave and tidal energy was replaced by the ocean energy; however without any legal definition. We believe that ocean energy is a broader concept than wave and tidal energy because the ocean energy can include also the energy of ocean currents. It follows from the above that a comprehensive calculation of renewable energy sources requires constant refinement and adjustments to the legal definition.

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[79] Directive 2009/28/EC, preamble, paragraph 9: *The European Council of June 2008 underlined the need to assess the possible impacts of biofuel production on agricultural food products and to take action, if necessary, to address shortcomings. It also stated that further assessment should be made of the environmental and social consequences of the production and consumption of biofuels*.

[80] Juan J. Cadillo-Benalcazar et al., "Why does the European Union produce biofuels? Examining consistency and plausibility in prevailing narratives with quantitative storytelling," *Energy Research & Social Science* 71, no. 1(2021): 101810, https://doi.org/10.1016/j.erss.2020.101810.

[81] Article 2(e) of the Directive 2009/28/EC: *biomass means the biodegradable fraction of products, waste and residues from biological origin from agriculture (including vegetal and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste.*

[82] Article 2(a) of the Directive 2009/28/EC.

[83] Article 2(b) of the Directive 2009/28/EC.

[84] Article 2(d) of the Directive 2009/28/EC.

The definition of biofuels was not changed. It is still *liquid or gaseous fuel for transport produced from biomass,*[85] but the definition of bioliquids was added and means *liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass*.[86] The new definition is justified as follows: *The introduction of sustainability criteria for biofuels will not achieve its objective if those products that do not fulfil the criteria and would otherwise have been used as biofuels are used, instead, as bioliquids in the heating or electricity sectors*.[87] However, it was overlooked that, in addition to heating, cooling and electricity, the biomass can also be used in other sectors of the national economy (including outside the energy sector), where no sustainability criteria for its use have been defined.

The Directive has been substantially amended several times. Additionally, it was necessary to set new, ambitious targets for the use of renewable energy sources by 2030, in line with the Union's commitment under the 2015 Paris Agreement on climate change, following the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change. As a result, the European legislator adopted the new Directive (EU) 2018/2001 of the European Parliament and of the Council on the promotion of the use of energy from renewable sources. Directive 2018/2001 introduced a set of rules for the use of renewable energy sources in electricity, heating, cooling, and transport within the EU. These rules aimed at mitigating climate change, protecting the environment, and reducing the EU's energy dependence. The Directive includes rules for promoting and using biomass for energy production, with defined sustainability and greenhouse gas emission-saving criteria.

Directive 2018/2001 increases the share of renewable energy sources in the EU's total energy consumption from the original 20%, as stipulated in Directive 2009/28/EC, to 32%, without any justification. The preamble of Directive does not include any relevant arguments, explanation or referring to any relevant scientific research that would justify the 32% target. There is mentioned only the Commission's communication of 22 January 2014, entitled "A policy framework for climate and energy in the period from 2020 to 2030," which outlines the framework for future Union energy and climate policies. The Commission proposed increasing the share of energy from renewable sources consumed in the EU to 27%. While the European Council approved this proposal with the recommendation that Member States should set more ambitious targets. In addition, the European Parliament, in its resolution of 5 February 2014, emphasized that, considering the Paris Agreement and the recent renewable technology cost reduction, it is desirable to be significantly more ambitious.[88] Based on these political conclusions, it appears that the "32% target" were not preceded by any scientific or expert analysis regarding their environmental, economic or social impacts.[89] However, the discussion on the share of energy from renewable sources were

[85] Article 2(i) of the Directive 2009/28/EC.
[86] Article 2(h) of the Directive 2009/28/EC.
[87] Directive 2009/28/EC, preamble, paragraph 67.
[88] 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, OJ L 328, 21.12.2018, preamble, paragraphs 5-6.
[89] There are many ongoing research projects related to the climate change and land use which results could

not finished by the adoption of the Directive. According to the Commission document in 2020[90] doubling the share of renewable energy sources to at least 40% was proposed. This proposal was included in 2023 into an amendment to Directive 2018/2001[91] which adjusted the minimum limits for the share of renewable energy sources to 42.5% of total energy consumption in the EU by 2030, with an additional recommended increase of 2.5% for Member States to reach the 45% target. This is a high share that could have significant impacts on the use of natural resources, as well as economic and social consequences, which need to be reassessed to avoid causing even more serious damage to the environment, individuals, and society. To avoid potential negative impacts, the sustainability criteria for the production and use of biomass should be defined using a holistic approach. These criteria should encompass not only the environmental dimension but also the social and economic dimensions, considering all the sustainable development goals. Achieving this, however, would be difficult without extensive scientific studies.

The Directive includes slightly modified definitions of key terms. Renewable energy means *energy from renewable non-fossil sources, namely wind, solar (solar thermal and solar photovoltaic) and geothermal energy, osmotic energy, ambient energy, tide, wave and other ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas, and biogas*.[92] The definition creates two subgroups of solar energy - thermal and photovoltaic energy. There are no legal definitions; however, the main difference consists in the technology that is used for energy production from the sun. While photovoltaics converts sunlight directly into electricity using semiconductors, solar thermal technology produces heat by using optics to heat a fluid (water, oil), which could be used for domestic hot water, space heating or producing steam to drive a turbine and generate electricity.[93] The new term is ambient energy, which means *naturally occurring thermal energy and energy accumulated in the environment with constrained boundaries, which can be stored in the ambient air, excluding in exhaust air, or in surface or sewage water*.[94] This term replaced the aerothermal and partially hydrothermal energy introduced in the directive 2009/28/EC. Moreover, the

be used in the legislative proposals of the EU secondary law, e.g. EUROPE-LAND.

[90] "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Stepping up Europe's 2030 climate ambition. Investing in a climate-neutral future for the benefit of our people," European Commission COM(2020) 562 final, accessed January 10, 2025, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX%3A52020SC0176.

[91] 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, OJ L, 2023/2413, 31.10.2023.

[92] Article 2(1) of the Directive 2018/2001.

[93] We use very simple explanation of these terms for the purposes of this paper; more detailed scientific explanation is provided e.g. Yassine El Alami et al., "Solar thermal, photovoltaic, photovoltaic thermal, and photovoltaic thermal phase change material systems: A comprehensive reference guide," *International Communications in Heat and Mass Transfer* 159 Part B, no 1 (2024): 108135, https://doi.org/10.1016/j.icheatmasstransfer.2024.108135 and there cited literature.

[94] Article 2(2) of the Directive 2018/2001.

hydrothermal energy includes not only thermal energy from surface and sewage water but also geothermal energy which is listed separately as well as thermal energy of ocean which is included in the term "other ocean energy." The Directive 2018/2001 reverted to the concept tide and wave energy used in the first directive 2001/77/EC and added "other ocean energy" such as thermal ocean energy or energy of ocean currents. In relation to hydropower, the Court of Justice of the EU clarifies that hydropower energy, as a form of renewable energy, also includes *energy generated by a small-scale hydropower plant, which is not a pumped-storage power station or a hydropower plant with a pumping installation, located at the point of discharge of industrial waste water from another plant which previously used the water for its own purposes*.[95] It means that the concept of hydropower covers not only electricity generated from hydropower provided by a natural water flow, but also electricity generated from hydropower provided from an artificial water flow.[96] The amendment of the Directive in 2023 added osmotic energy to this enumeration as energy *created from the difference in salt concentration between two fluids, such as fresh water and salt water*.[97] The list of renewable energy sources is being revised again, possibly even reverting to the original terminology. The 2023 amendment introduces yet another new source—osmotic energy. Given the rapid advancements in science and technology in this field, it is likely that this legal definition will require frequent updates if it continues to rely on an exhaustive enumeration of renewable sources. However, changes in the definition of renewable energy sources can be used to track progress and shifts in their classification.

The legal definition of biomass has not been modified, except for the inclusion of a condition regarding industrial and municipal waste. This condition specifies that the waste must be of *biological origin*, thereby excluding biodegradable waste that is not of biological origin (e.g., paper, cardboard, natural textiles, processed wood).[98] On the other hand, product packaging made from biodegradable plastics, such as those derived from corn starch or edible materials from fruits and vegetables, would fall under the given definition. However, non-food crops, including energy wood, were not directly included in the definition of biomass. Instead, the definition of lignocellulosic material was added to the directive, which also encompasses energy wood. It is used to produce biogas as a gaseous fuel made from biomass; therefore, energy woody plants can be considered biomass.

Moreover, the definition of biomass has not undergone major changes, it should be noted that the legal definitions of this term differ in secondary EU law. Directive 2010/75/EU on industrial emissions established rules for the integrated prevention and control of pollution arising from industrial activities. It thereby provides a legislative framework, which is supplemented by other specific legal regulations addressing

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[95] Judgment of the Court (Second Chamber) of 2 March 2017. Case C-4/16. J. D. v Prezes Urzędu Regulacji Energetyki.

[96] Ibid, paragraphs 22 – 31.

[97] Article 2 (44b) Directive 2018/2001.

[98] "Green Paper on the management of bio-waste in the European Union," European Commission COM(2008) 811 final, accessed 20 January, 2025, https://www.europarl.europa.eu/meetdocs/2009_2014/documents/com/com_com(2008)0811_/com_com(2008)0811_en.pdf.

particular environmental issues. We would therefore expect the basic terms in this area to be defined uniformly. However, according to the directive, biomass is considered to include only vegetable matters and waste of agriculture and forestry, vegetable waste from the food processing industry, fibrous vegetable waste from virgin pulp production and from production of paper from pulp, cork and wood waste. This means that biomass does not include substances of animal biological origin or substances from aquaculture, which are considered as biomass in the directives on renewable resources. It would be reasonable for a directive to address specific topics related to plant biomass, but the directive 2010/75/EU is a general legal provision in the field of integrated pollution prevention and control in industry. A broad range of issues cannot be regulated within a single legal document. However, it would be helpful for the addressees of legal norms and their legal certainty if at least the key concepts and terms were defined consistently, even when they appear in different legal provisions.

The definition of biofuels was significantly modified. Biofuels are only liquid fuels for transport produced from biomass. If the liquid fuels are used for purposes other than transport (e.g. electricity, heating, cooling) and are produced from biomass, they are classified as bioliquids. Other forms of fuels (solid or gaseous) produced from biomass regardless of the sector of their use, are called biomass fuels. The fuels from the renewable energy sources are added by the renewable fuels of non-biological origin which means *liquid and gaseous fuels the energy content of which is derived from renewable sources other than biomass*[99] (e.g. hydrogen). The amendment to the definition of biofuels, whereby the term now encompasses exclusively liquid biofuels, is closely linked to the objective of safeguarding the functioning of the internal market. While the European Union permits Member States to establish additional sustainability criteria applicable to biomass fuels, it precludes them from refusing to recognise biofuels and bioliquids as renewable energy sources for the purposes of this Directive on grounds other than those expressly provided for therein. This restriction is justified by the overarching aim of ensuring the effective operation of the internal energy market. It follows there from that biofuels and bioliquids constitute an essential element in the functioning of EU internal market. In accordance with paragraph 64 of the preamble to the Directive, it is further intended to guarantee that biofuels and bioliquids meeting the harmonised sustainability criteria set out in the Directive shall continue to benefit from the trade facilitation measures envisaged therein, including with respect to the outermost regions to which the Directive applies.

The energy science usually divides biofuels into several generations: (1) the first generation is made from food and feed crops; (2) the second one is produced from residual non-food parts of current crops (such as stems, leaves and husks), the food crops, non-food crops (such as switchgrass or miscanthus) and industry waste (such as wood chips, skins and pulp from fruit pressing); (3) the third generation biofuels are obtained from algae; (4) the fourth generation are synthetic and solar biofuels.[100] But the Directive distinguishes only between the biofuels and advanced biofuels. The

[99] Article 2 (36) Directive 2018/2001.

[100] Karel Janda et al., "Biofuels: Policies and impacts," *Agricultural Economics (Czech Republic)* 58, no. 8 (2013): 372, https://doi.org/10.17221/124/2011-agricecon.Janda et al., 2012.

biofuels are broader term and includes also advanced biofuels. However, while biofuels are produced from biomass defining as fraction, waste and residues from agriculture, forestry and related industries including industrial and municipal bio-waste, advanced biofuels are produced only from the feedstock listed in Part A of Annex IX of the Directive 2018/2001 (e.g. algae, biowaste, straw, etc.).[101]

The Directive also encompasses biofuels, bioliquids, and biomass fuels derived from food and feed crops as fuels of first generation. However, considering the risks associated with indirect land-use change[102] and the potential demand for additional land—whereby the cultivation of such crops may encroach upon areas with high carbon stock or significant biodiversity value—the Directive imposes limitations on the proportion of these fuels that may be counted towards renewable energy sources. *It is therefore appropriate, in general, to limit food and feed crops-based biofuels, bioliquids and biomass fuels promoted under this Directive and, in addition, to require Member States to set a specific and gradually decreasing limit for biofuels, bioliquids and biomass fuels produced from food and feed crops for which a significant expansion of the production area into land with high-carbon stock is observed.*[103] Furthermore, pursuant to Article 26(2) of the Directive, this proportion shall be progressively reduced to 0% by no later than the end of 2030. However, *low indirect land-use change-risk biofuels, bioliquids and biomass fuels should be exempt from the specific and gradually decreasing limit.*[104]

4. Sustainable Criteria for Agricultural and Forest Biomass

The first directives did not include sustainability criteria themselves but only referred to compliance with those established in the CAP rules. The previous directive 2009/28/EC focused on the sustainability criteria applied only to the production and the use of biofuels (at that time, gaseous biofuels were also included) and bioliquids. The sustainability criteria of the current directive 2018/2001 also apply to solid and gaseous biomass used for heating, cooling, and electricity generation. Moreover, the Directive introduced sustainability criteria specifically for agricultural and forest biomass.

The sustainable criteria are stipulated in Article 29 of Directive 2018/2001/EU, as amended by Directive 2023/2413. This article regulates the sustainability and greenhouse gas emission savings criteria for biofuels, bioliquids, and biomass fuels. The Court of Justice of the EU emphasizes the importance of these criteria. Article 29 aims to ensure, with a view to guaranteeing a high level of environmental protection, that biofuels may only be considered by the Member States for the three environmental purposes set out in Article 17(1) of the directive (now Article 29(1) of Directive

[101] Part B Annex IX of the Directive 2018/2001 as amended.
[102] According to the paragraph 81 of the preamble of the Directive: Indirect land-use change occurs when the cultivation of crops for biofuels, bioliquids and biomass fuels displaces traditional production of crops for food and feed purposes. Such additional demand increases the pressure on land and can lead to the extension of agricultural land into areas with high-carbon stock, such as forests, wetlands and peatland, causing additional greenhouse gas emissions.
[103] Paragraph 81 of the preamble of Directive 2018/2001.
[104] Ibid.

2018/2001), provided they meet the sustainability criteria outlined by the EU legislature. These purposes set out in the Article 29(1) are: first*, the verification of the extent to which the Member States meet their national targets and the European Union's target set in (...) Article 3(1) of Directive 2018/2001,*[105] secondly*, the assessment of compliance with their renewable energy obligations, including, with regard to Directive 2018/2001, the obligation relating to the minimum share of renewable energy in the final energy consumption in the transport sector laid down in Article 25 of the latter directive and,* thirdly, *the possible eligibility for financial support for the consumption of biofuels and bioliquids*[106] (including biomass fuels after the adoption of Directive 2018/2001).

Secondly, Article 29 seeks (…) *to facilitate trade in sustainable biofuels between the Member States*. *That facilitation lies primarily in the fact that (...) when biofuels, including those coming from other Member States, satisfy the sustainability criteria set out in Article 17 of Directive 2009/28* (now Article 29 of Directive 2018/2001), *paragraph 8* (now paragraph 12) *of that article prohibits the Member States from refusing to take those sustainable biofuels into account for the three purposes set out in Article 17(1) of that directive.*[107] As follows from the above, if biofuels meet the sustainability criteria under the Directive, they should be recognized for the purposes of the Directive, regardless of whether they are coming from domestic production or another Member State. Therefore, it seems that the sustainable criteria are enumerated exhaustible, but not for all fuels from renewable sources, only for fuel of liquid state. It confirms also the Court of Justice when judged that *in the context thus drawn, that harmonisation is, furthermore, exhaustive, since Article 17(8) of Directive 2009/28 states that Member States may not, for those same three purposes, refuse to consider, on other sustainability grounds, biofuels which fulfil the sustainability criteria set out in that article*.[108] Moreover, the case is related only to biofuels, but the Directive 2009/28 focused not only for biofuels but also on the bioliquids; however, Directive 2018/2001 did not extend this provision to solid and gaseous fuels from biomass. On the contrary, in the case of biomass fuels, it allows Member States for the above-mentioned purposes to establish additional sustainability criteria for biomass fuels. The question arises as to why the EU has set maximum harmonisation for liquid biofuels while allowing minimum harmonisation for solid and gaseous fuels. This may be because liquid fuels are usually traded between states, making unified sustainability criteria necessary. To facilitate the free movement of biofuels and bioliquids within the internal market, the EU has opted for maximum harmonisation. In contrast, solid and gaseous biomass fuels, which are primarily used for heating, cooling, and electricity generation, are more often consumed within national markets and are traded among

[105] Article 3 of Directive 2018/2001 sets binding overall Union target for 2030 related to the share of energy from renewable sources.
[106] Judgment of the Court (Third Chamber) 29 July 2024 Case C 624/22. BP France SAS v Ministre de l'Économie, des Finances et de la Souveraineté industrielle et numérique, paragraph 41.
[107] Judgment of the Court (Second Chamber) of 22 June 2017. Case C-549/15. E.ON Biofor Sverige AB v Statens energimyndighet, paragraphs 33-34.
[108] Ibid, paragraph 32.

Member States less frequently. This is evidenced by the fact that they were only included in the legal framework of the directive in 2018. As a result, the EU has afforded Member States the opportunity to establish additional sustainable criteria. This approach is possible for two key reasons: firstly, it considers the national and regional specificities of individual countries and secondly, it provides Member States with flexibility in proposing potential additions to the sustainability criteria, which could inspire the EU when updating the sustainability criteria at European level, as highlighted in the second sentence of paragraph 14, which states: *By 31 December 2026, the Commission shall assess the impact of such additional criteria on the internal market, accompanied, if necessary, by a proposal to ensure harmonisation thereof.*

In addition, sustainability criteria of Directive 2018/2001 primarily deal with environmental impacts and neglect social and economic impacts such as land rights conflicts, job opportunities, farmers' income and food price increasing or even aesthetic values.[109] Only direct and indirect land-use changes are considered, not directly in Article 29, which stipulates the sustainability criteria, but rather in Article 26, which imposes limitations on the biomass derived from food and feed crops that may be counted towards renewable energy consumption.

Moreover, Article 29 (14) allowing the Member States to establish additional sustainability criteria for biomass fuels is not limited to the environmental criteria. The previous directive did not include any similar provision. The Member States may add missing social, economic, or other necessary sustainability criteria to their national legislation. The Commission will decide whether to incorporate them also into EU legislation after assessment their impact on the internal market, and if relevant, will prepare a proposal to ensure their harmonization within the internal market.

To achieve the purposes and the targets for the share of renewable energy sources in total energy consumption, including specific objectives for individual sectors of the national economy, and to provide financial support, the European legislator establishes sustainability criteria for biofuels, bioliquids and biomass fuels originating from agricultural or forestry production. It was biomass production in agriculture and forestry that showed the largest legislative gaps in ensuring sustainable biomass production.[110] This means that, regardless of the production phase of fuels derived from biomass, the sustainability criteria are not applied to them when they are produced from waste or residues other than agricultural (including aquaculture and fisheries) and forestry residues. In this case, only the greenhouse gas emissions savings criteria of paragraph 10 of Article 29 are applied.

The sustainability criteria for fuels produced from agricultural and forest biomass are defined in paragraphs 2-7 of Article 29 of Directive 2018/2001, as amended. However, the paragraph 2 is related only to the agricultural biomass, the paragraphs 3 – 5 are related to the agricultural biomass but could be applied also on the forest biomass

[109] Kateryna Melykh and Sudhir Jha, "Regulation of biomass production in EU from global socio-economic perspective," IJONESS 4, vol. 2 (2016): 74, https://doi.org/10.5604/01.3001.0010.3907.

[110] "Sustainable and optimal use of biomass for energy in the EU beyond 2020. Final report," European Commission, accessed January 10, 2025, https://energy.ec.europa.eu/publications/sustainable-and-optimal-use-biomass-energy-eu-beyond-2020_en.

when specific requirements are fulfilled. The last paragraphs 6 and 7 of sustainable criteria are related only to the forest biomass.

4.1. Sustainable Criteria for Fuels Produced from Agricultural and Forest Biomass

The first sustainability criterion (in paragraph 2 of Article 29) explicitly excluded fuels produced from forest biomass, because the forest biomass is mentioned in the paragraph 6 where the national or regional laws or forest management systems are applied. Second, the paragraph 2 is applied only when biofuels, bioliquids and fuels from biomass are produced from waste and residues from agricultural land. It means that paragraph 2 does not apply to energy crops or energy plants cultivated on agricultural land. Third, *biofuels, bioliquids and biomass fuels produced from waste and residues derived from agricultural land shall be regarded as renewable energy sources for the purposes* of fulfilling the obligation of the EU and Member States *only where operators or national authorities have monitoring or management plans in place* to *address the impacts on soil quality and soil carbon*. For example, in Slovakia, biofuels, bioliquids, and biomass fuels produced from waste and residues originating from agricultural land shall meet the sustainability criteria if the suppliers of raw materials for their production comply with the obligations related to carbon balance control, soil quality, and soil carbon management pursuant to a special regulation.[111] According to this rule the landowner or land user is obliged to carry out control of the soil organic matter balance and use management methods that do not cause the limit value of the soil organic matter balance deficit to be exceeded.[112]

Even in the new directive, the EU does not directly address soil quality protection, but rather through monitoring or management plans introduced by the Member States in accordance with their national legislation. Soil protection in the EU has long been a debated issue, but unlike water or air protection, it has not yet been possible to establish uniform rules for soil protection at the EU level. Other sustainability criteria for biomass from agricultural land also address soil protection only marginally, focusing on preserving habitats, biodiversity, soil carbon, and preventing its release into the air.

The second sustainability criterion excludes the biofuels, bioliquids and biomass fuels produced from agricultural biomass made from raw material obtained from land with a high biodiversity value, namely:

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[111] §7 of the Act No. 220/2004 Coll. on the protection and use of agricultural land and on amending Act No. 245/2003 Coll. on integrated prevention and control of environmental pollution and on amending and supplementing certain acts; Decree of the Ministry of Agriculture of the Slovak Republic No. 508/2004 Coll., implementing Section 27 of Act No. 220/2004 Coll. on the Protection and Use of Agricultural Land and on Amendments to Act No. 245/2003 Coll. on Integrated Prevention and Control of Environmental Pollution and on Amendments to Certain Acts.

[112] Annex 6 (3) of the Decree no. 508/2004 Coll.: *The content and quality of soil organic matter are threatened when losses begin to predominate in the balance of organic carbon inputs and outputs, and according to the balance model, this deficit reaches 2 t Cox.ha-1.year on soils with a humus content of up to 1.5% and 3 t Cox.ha-1.year in soils with a humus content above 1.5%.*

1) intact or pristine forests, such as *primary forest, forest and other wooded land of native species without visible human activity and without significant disturbance of ecological processes and old growth forests according to the national definition of a country, where the forest is located*. The prohibition is absolute, with no exemptions allowed, including any proof of disturbance caused by human activity. However, national definitions allow for the consideration of the national or regional specificities of the Member States.

2) *highly biodiverse forest and other wooded land which is species-rich and not degraded and must been identified as being highly biodiverse by the relevant competent authority* at the national or EU level, such as habitats of national and European importance. However, there is one exemption: the biomass can be used to produce the fuels *unless evidence is provided that the production of that raw material did not interfere with those nature protection purposes.* Vice versa, if it interferes with purposes other than those nature protection ones, the biomass can be used for production of fuels without limitations. However, the assessment of this is questionable. Other purposes than those based on which the relevant authority identified land as highly biodiverse may indirectly affect the biodiversity of the protected area. Therefore, we believe that the exemption should not be focused only on the purposes for which the area is protected. It is questionable whether we can account for all the environmental factors that contribute to the high diversity of an area, and which biomass cultivation must not impact to prevent the loss of biodiversity.

3) *protected nature areas and areas designated for the protection of rare, threatened or endangered ecosystems or species*. Both areas should be recognised by law or relevant authority. The protected nature areas should be designated by law or relevant authority of EU law or national laws of Member States. The areas with protected ecosystems or species should be recognised by international law or international organisations, or by the European Commission. There is also one exemption from this rule. The biomass can be used to produce the fuels *unless evidence is provided that the production of that raw material did not interfere with those nature protection purposes.*[113] Similarly to the previous point, the question arises as to whether we are able to take into account for all the environmental factors that contribute to the high diversity of an area, and which biomass cultivation must not impact to prevent the loss of biodiversity.

4) *highly biodiverse grassland spanning more than one hectare that is* natural or non-natural[114] grasslands. There is also one exemption focused only on the non-natural grasslands. The raw material could be harvested only if it is necessary to preserve its status of highly biodiverse non-natural grasslands.

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[113] The language versions of the directive are not identical, some language versions refer to "those nature protection purposes," such as English, German, French, Polish or Slovak version, while the Czech, Croatian and Italian versions contain a generalised text "nature protection" without reference to the reasons for which the areas were declared protected. We believe that the second option better fulfils the purpose.

[114] According to the Article 29 (3)(d)(ii) of the Directive 2018/2001: Grassland that would be cease without human intervention and it is species-rich and not degraded. Slovak version of the Directive uses the term "semi-natural" grasslands.

5) and *heathlands*. Heathlands are dynamic plant communities characterized by a high cover of sclerophyllous, ericoid shrubs that develop over nutrient-poor soils.[115] The term "heathlands" was added by the amendment, Directive 2023/2413. No exemption for biomass cultivation is allowed here.

The criteria primarily emphasize the protection of biodiversity and rare ecosystems, rather than focusing on soil conservation. The criteria do not prevent energy crops from being grown on the best-quality land in Member States, which should primarily be intended to produce food and feed. This responsibility remains with the Member States, which, however, cannot reject biofuels and bioliquids obtained from the best-quality land in other Member States for the purposes of this Directive that have not introduced such restrictions. Imports of such biofuels and bioliquids from third countries may be even less affected by Member States.

Moreover, these conditions are applied also on the fuels produced from the forest biomass when the criteria in paragraph 6 points (a) (vi) and (vii) of Article 29 are not met. This criterion was added after the adoption of the Directive 2023/2413. The paragraph 6 sets the criteria for biofuels, bioliquids and biomass fuels produced from forest biomass to be able to include for the purposes of renewable energy sources. The criterion (vi) prohibits to harvest forest biomass from lands such as primary forest and other wooded land including old growth forest, highly biodiverse forests and grasslands, heathlands and criterion (vii) asks to issue a statement of assurance that the forest biomass is not sourced from these types of lands. It means that the forest biomass that does not meet the conditions of paragraph 6 (a) (vi) and (vii) could be included under the biomass from renewable sources for the purpose of Article 29 when comes from highly biodiverse forests; however, the production of that raw material did not interfere with those nature protection purposes. In the case of intact or pristine forests and heathlands, neither forest biomass nor agricultural biomass is considered for the fulfilling the purposes of Article 29.

The third criterion is set out in paragraph 4 of Article 29. There are excluded the biofuels, bioliquids and biomass fuels produced from agricultural biomass made from raw material obtained from land with high-carbon stock, namely (1) wetlands, i.e. *land that is covered with or saturated by water permanently or for a significant part of the year* (the clarification of the term "wetland" is very important because there is no uniform definition of it[116] and the clarification of this term is a necessary condition for correct application of sustainable criteria of this paragraph),[117] (2) *continuously forested*

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[115]Jaime Fagúndez, "Heathlands confronting global change: drivers of biodiversity loss from past to future scenarios," *Annals of Botany* 111, no. 2 (2013): 151, https://doi.org/10.1093/aob/mcs257.

[116] Hongjun Chen et al., "Wetland definitions: Creation, evolution and application," *Wetland Science* 8, no. 3 (2010): 299.

[117] There is no consensus on the definition of wetlands, e.g. *wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.* (Convention on Wetlands of International Importance especially as Waterfowl Habitat signed on 2 February 1971 in Ramsar (Iran) and entered into force in 1975 (https://www.ramsar.org/); Denise J. Reed, "Wetlands," in *Encyclopedia of Coastal Science. Encyclopedia of Earth Science Series*, ed. M. L. Schwartz (Springer, 2005), 1077: *Wetlands are neither terrestrial nor aquatic systems and at the coast form part of*

areas (*more than one hectare with trees higher than 5 meters and a canopy cover of more than 30% or trees able to reach those thresholds in situ*), and (3) *land spanning more than one hectare with trees higher than five metres and a canopy cover of between 10 % and 30 % (or trees able to reach those thresholds in situ).* There is only one exemption and only for land under the third point, i.e. land spanning are not excluded when there is evidence that the carbon stock before and after conversion enables to fulfil the conditions laid down in paragraph 10 of Article 29 related to the limitation of greenhouse gas emissions.

Moreover, biofuels, bioliquids and biomass fuels produced from forest biomass obtained from wetlands are also excluded;[118] however, this does not apply if the wetland status has not changed since January 2008. This criterion was added after the adoption of Directive 2023/2413.

The purpose of this provision is to prevent carbon from being released into the air from carbon-rich soil. Therefore, the European legislator has allowed this biomass to be counted as a renewable energy source, even if it is produced on such soil, if the soil's status has not changed. The reference date is January 2008, which preceded the adoption of Directive 2009/28. The third sustainability criterion focuses on preserving soil carbon, rather than on soil protection itself. In addition, the sustainability criteria do not address economic and social aspects, nor do they cover the full range of environmental concerns, particularly regarding soil protection.

The fourth criterion is defined in paragraph 5 of Article 29. Biofuels, bioliquids and biomass fuels produced from agricultural biomass are excluded from the purposes of Article 29 if they are *made from raw material obtained from the land that was peatland*[119] *in January 2008*. However, this biomass can be counted as a renewable energy source if *the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil*. Moreover, biofuels, bioliquids and biomass fuels produced from forest biomass obtained from peatlands are also excluded;[120] however, this does not apply if the peatlands did not lose their status of undrained soil since January 2008. This criterion was added after the adoption of Directive 2023/2413.

The peatland sustainability criteria also focus on the same objectives as the

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a continuous gradient between upland and ocean. The most obvious characteristic of all wetlands is continuous, seasonal, or periodic standing water or saturated soil.

[118] Wetlands are also excluded under the paragraph 6 (a) (vi) and (vii) of Article 29; however, unlike in paragraph 4, there is no exemption related to the maintenance of the soil status as wetlands.

[119] There is no legal definition of peatland. Max C. Finlayson and Randy G. Milton, "Peatlands," in *The Wetland Book*, ed. C. Finlayson, G. Milton, R. Prentice and N. Davidson (Springer, 2018), 227: *Peatlands are ecosystems that are characterized by the accumulation of organic matter that is derived from decaying plant material under permanent water saturation*. Hyunyoung Yang et al., "Trends of Peatland Research Based on Topic Modeling: Toward Sustainable Management under Climate Change," *Forests* 14, no. 9 (2023):1818, https://doi.org/10.3390/f14091818: *Peatlands are wetlands with an accumulation of peats, partially decomposed organisms, under waterlogged and anoxic conditions.* Dan J. Charman, "Peat and Peatlands," in *Encyclopedia of Inland Waters*, ed. Gene E. Likens (Academic Press, 2009), 541: *Peatlands are a distinctive wetland type, characterized by the accumulation of partially decayed organic matter, forming layers of peat*.

[120] Peatlands are also excluded under the paragraph 6 (a) (vi) and (vii) of Article 29; however, unlike in paragraph 5, there is no exemption related to the maintenance of undrained soil.

previous sustainability criteria because they are important landscape elements due to their high biodiversity and to their capacity to absorb atmospheric carbon and bind it in peat. Moreover, they play an important role in water retention in the landscape.

The criteria are solely based on the land status as of 2008 and do not consider land that was illegally converted for biomass cultivation prior to that year. Additionally, sustainability criteria for non-energy purposes are still missing. The criteria outlined above do not prevent the cultivation of agricultural and forestry biomass on land with high biodiversity value, but they only do not allow such biomass to be counted for the purposes of the objectives outlined in Article 29(1) of Directive 2018/2001.

It can be stated that the criteria have been enhanced in comparison to the sustainability standards established in the 2009 directive, as they now extend their applicability to not only liquid fuels but also to gaseous and solid fuels derived from biomass. They provide protection for several more types of habitats, such as heathlands and forests with high biodiversity, which were not protected under the previous directive. However, the environmental dimension of sustainability has not changed, and it does not address economic and social aspects at all. From an environmental dimension, it only focuses on the protection of biodiversity and the preservation of carbon in the soil. Measures to protect soil quality, preserve the highest-quality soil for growing food and fodder, and ensure its long-term sustainability are still missing. However, there is an effort in Article 26 of Directive 2018/2001 to prevent energy biomass from being cultivated at the expense of food and feed production, which would then be shifted to newly acquired land derived from the management of high-carbon soils. Detailed criteria shall be adopted in Commission Delegated Regulation (EU) 2019/807.[121] The regulation lays down the criteria for determining the high indirect land use change risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed. It is laid down in a separate secondary legal act because Directive 2018/2001 did not focus on sustainability criteria concerning emissions caused by indirect land-use change. Land is usually used for food and feed production, and the demand for food and feed must still be met regardless of whether the land is used for energy biomass production. In this case, there is a risk that agricultural production will expand into areas with high carbon stocks, such as forests, wetlands, and peatlands, leading to additional greenhouse gas emissions. The riskiest crops include palm oil, soybean, maize and sugar cane. Their share of extension into land types, including continuously forested areas and land spanning[122] various uses, ranges from 4% to 45% over a span of 10 years. Moreover, the palm oil has also expanded into wetlands (23%).[123] On the other hand, growing energy crops encourages land grabbing, i.e. the large-scale acquisition of land through buying or renting by a

[121] Commission Delegated Regulation (EU) 2019/807 supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council as regards the determination of high indirect land-use change-risk feedstock for which a significant expansion of the production area into land with high carbon stock is observed and the certification of low indirect land-use change-risk biofuels, bioliquids and biomass fuels; OJ L 133, 21.5.2019.

[122] Paragraph 4 (b) and (c) of the Article 29 of the Directive 2018/2001.

[123] Annex of the delegated Regulation 2019/807.

company for the purpose of energy crop production.[124] With the legislation, the European Union is striving to find an optimal balance between achieving ambitious objectives in the field of renewable energy sources and minimizing the negative environmental impacts of reaching these objectives.

4.2. Sustainable Criteria for Fuels Produced from Forest Biomass

The sustainable criteria stipulated in the paragraphs 6 and 7 of Article 29 are related only the biofuels, bioliquids and biomass fuels produced from forest biomass. The forest biomass can be considered as the biomass form renewable resource when these criteria are met.[125] The paragraph 6 of Article 29 is focused on the forest protection and forestland protection including the forest biodiversity against unsustainable forest management. The paragraph 7 is focused on the carbon economy in the forest including the international obligation of the EU and the Member States.

The sustainability criteria of forest biomass are ensured by the national or sub-national laws or by management systems at forest sourcing area level when the law is missing.

If there is a national or sub-national law, the laws shall ensure (1) the legality of harvesting operations; (2) forest regeneration of harvested areas; (3) preserving biodiversity and preventing habitat destruction in the areas designated by law or relevant authorities for nature protection purposes including wetlands, grassland, heathland, and peatlands; (4) maintenance of soil quality and biodiversity in accordance with sustainable forest management principles (e.g. avoidance of degradation of primary and old growth forests or their conversation into plantation forest or harvesting on vulnerable soils); (5) maintenance or improving the long-term production capacity of the forest; (6) prohibition of any harvesting in the areas with the status primary forests, old growth forests and other wooded land of native species without visible human activity, highly biodiverse forest and other wooded land which is species-rich and not degraded, highly biodiverse grassland spanning more than one hectare that is natural or non-natural, heathlands, wetlands and peatlands;[126] and (7) a statement of assurance that the forest biomass is not sourced from these lands. The Member States are obliged to ensure monitoring and law enforcement related to those criteria.

If the law is missing, management systems at forest sourcing area level are applied. They shall ensure compliance with only the first five conditions. The fulfilment of these criteria should be proven by economic operators through their management systems. Therefore, *it is necessary to establish in more detail the evidence of*

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[124] Logan Cochrane, "Land Grabbing," in *Encyclopaedia of Food and Agricultural Ethics,* ed. David M. Kaplan, Paul B. Thompson Edition: Living Reference Work Entry, Publisher: Springer Editors: David M. Kaplan and Paul B. Thompson (Springer, 2016), 2-3; Bin Yang and Jun He, "Global Land Grabbing: A Critical Review of Case Studies across the World," *Land* 10, no. 3 (2021): 324, https://doi.org/10.3390/land10030324.

[125] Except criteria under paragraph 6 (a) (vi) and (vii) when paragraphs 3 to 5 can still be applied as mentioned in previous subchapter.

[126] The reference for determination of land status date is January 2008 like in the case of agricultural biomass. More detailed information is in previous subchapter.

sustainability which should be provided by economic operators through management systems at forest sourcing area level, when compared to that required under the national and sub-national compliance assessment.[127]

The second group of sustainability criteria for forest biomass relates land use, land use change and forestry (hereinafter referred to as LULUCF), usually called as criteria of carbon economy. These sustainability criteria should be met as defined in paragraph 7 of Article 29.

There are three possible ways to prove compliance with the carbon economy obligation in the forest. The first two are connected to Paris Agreement on climate change and could be used when a country is a party of this agreement.[128]

First, the country *has submitted a nationally determined contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC), covering emissions and removals from agriculture, forestry and land use which ensures that changes in carbon stock associated with biomass harvest are accounted towards the country's commitment to reduce or limit greenhouse gas emissions.*[129] The EU and its Member States has adopted the NDC on the base of Paris Agreement. The EU has updated this NDC document in 2023 and the Council has submitted updated NDC on behalf of EU and Member States to UNFCCC.[130] According to the updated document a Union binding target of net removals in the LULUCF sector is set by the regulation 2023/839 which amends Regulation 2018/841.[131]

Second, a party of Paris Agreement has its *national or sub-national laws in place, in accordance with Article 5 of the Paris Agreement, applicable in the area of harvest, to conserve and enhance carbon stocks and sinks, and provides evidence that reported LULUCF-sector emissions do not exceed removals*.[132] The parties of the Paris Agreement have established and, for the most part, consistently updated their NDCs.[133] As a result, this provision is unlikely to be relevant.

The third ways to prove the compliance with the carbon economy LULUCF in forest should be applied when a state is not a party to the Paris Agreement. Since only a few Middle Eastern states are not parties to this agreement, we could consider this provision to be rarely applicable. However, the issue arises with the USA, which has ratified the Paris Agreement, but its membership remains unstable. In the event of their

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[127] Commission Implementing Regulation (EU) 2022/2448 of 13 December 2022 on establishing operational guidance on the evidence for demonstrating compliance with the sustainability criteria for forest biomass laid down in Article 29 of Directive (EU) 2018/2001 of the European Parliament and of the Council, OJ L 320, 14/12/2022, preamble, paragraph 5 and article 4.

[128] Most states in the international community have ratified the Paris Agreement, except for some Middle Eastern countries and the United States, which repeatedly withdraws from and re-admit the agreement depending on the country's political orientation (more detailed information: https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en).

[129] Paragraph 7 (a)(i) of the Article 29, Directive 2018/2001 as amended.

[130] Update of the NDC of the European Union and its Member States available online: <https://unfccc.int/sites/default/files/NDC/2023-10/ES-2023-10-17%20EU%20submission%20NDC%20update.pdf>.

[131] The EU's collective target is 310 Mt CO_2 in net removals. Annex IIa of the Regulation 2018/842 as amended sets the national targets of the Member States to be achieved in 2030.

[132] Paragraph 7 (a)(ii) of the Article 29, Directive 2018/2001 as amended.

[133] NDC Registry available <https://unfccc.int/NDCREG>.

another withdrawal on January 27, 2026, the importance of this paragraph may increase. According to the paragraph 7 (b) the biofuels, bioliquids and biomass fuels produced from forest biomass shall be considered for the purposes of contributing towards the renewable energy shares *if management systems are in place at forest sourcing area level to ensure that carbon stocks and sinks levels in the forest are maintained or strengthened over the long term.*[134]

Moreover, amendment 2023/2413 has included paragraphs 7a and 7b to Article 29, which link the obligations of the EU and the Member States under the Paris Agreement. The production of biofuels, bioliquids and biomass fuels from domestic forest biomass shall be consistent (1) with Member States' commitments; it means that each Member State shall ensure that greenhouse gas emissions do not exceed greenhouse gas removals and achieve its limit in 2030; and (2) with the integrated national energy and climate plans (NECP) of Member States elaborated and submitted to the Commission. The national plans focused on 5 main objectives of the EU energy policy such as decarbonisation, energy efficiency, energy security, internal energy market and research, innovation and competitiveness. The NECPs were updated in 2023 and will be updated regularly every 10 years.[135]

The protection of forests and forest soil is not regulated by common EU rules; instead, it is the responsibility of Member States to implement appropriate measures through their own legislation or management systems. The European sustainability criteria designate areas where biomass production—aimed at meeting the objectives of Article 29(1) of the Directive—is prohibited. In other forested areas, biomass cultivation is allowed, ensuring legal wood harvesting while promoting forest renewal and maintaining soil quality. Like agricultural land, the sustainability criteria prioritize the protection of biodiversity and rare ecosystems but leave decisions regarding forest conservation, logging practices, and regeneration to national authorities. However, the relevance of these new sustainability rules for forest biomass remains uncertain, as each country must integrate them into its regulatory framework. The primary benefit of this system is that compliance with sustainability conditions can be demonstrated through a statement of assurance.

European legislation outlines biomass sustainability criteria for agricultural and forest land in a context of numerous other legal regulations, delegated and implementing acts, international treaties, and obligations. These criteria must also be interpreted in relation to legal provisions concerning the protection of other natural resources and environmental components, such as the Water Framework Directive, the Waste Framework Directive, the Habitats and Birds Directives, the Fuel Quality Directive, the Industrial Emissions Directive, and many others. However, delving further into these topics would exceed the scope of this article. In legal scholarship, this issue is rarely addressed; most publications on the subject appear in articles focused on

[134] Paragraph 7 (b) of the Article 29, Directive 2018/2001 as amended.

[135] The recommendations for each Member States together with the NECPs of Member States are available at the website of EU Commission <https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en>.

the natural sciences. Consequently, a comprehensive analysis requires an interdisciplinary approach, as a legal examination of the provisions cannot be conducted without insights and expertise from various fields of natural science.

5. Conclusion

Biomass energy is a sustainable alternative to fossil fuels and represents one of the renewable energy sources necessary to achieve the international commitments of the EU and the Member States in the field of climate change, namely by the Kyoto Protocol and Paris Agreement. However, the cultivation of energy biomass is a challenge such as land use changes that may affect food security and competition for land and water, forest degradation and biodiversity loss and releasing carbon from carbo-rich soils into the atmosphere. Therefore, the sustainability criteria established in EU secondary law are crucial for ensuring that biomass energy contributes to the achievement of the objectives of EU energy policy and its international commitments, while also facilitating sustainable land and forest management and the preservation of biodiversity. It is therefore logical that the initial efforts to introduce sustainability criteria primarily emphasize the environmental dimension of sustainability. However, like the previous directive, Directive 2018/2001 also addresses only environmental sustainability criteria, specifically those that contribute directly to climate change mitigation and the reduction of greenhouse gas emissions. These include biodiversity protection, the preservation of valuable ecosystems, and carbon sequestration in the soil. Nevertheless, the Directive allows Member States to introduce additional sustainability criteria exclusively for biomass fuels, without constraining these criteria to environmental aspects alone. This means that Member States can incorporate social and economic sustainability criteria into their national legislation. The European Commission will assess the impact of such additional criteria on the internal market and, if necessary, propose measures to ensure their harmonization. However, the Commission Delegated Regulation, in the context of Article 26 of the Directive, appears to address indirect land-use change issues related to economic and social sustainability aspects, such as the cultivation of food and feed on land. However, a deeper analysis reveals that these provisions are primarily intended to prevent the expansion of food and feed cultivation—potentially used for energy purposes—onto land with high carbon content, which could lead to carbon release into the atmosphere. On the contrary, there are no requirements for protecting soil from degradation or for preserving high-quality soil for growing food and feed. A step forward, however, is the possibility of utilizing abandoned and unused land. The directive allows biomass obtained from such land to be classified as a renewable energy source with a low risk of indirect land-use change, i.e. meaning land originally designated for food and feed production that is ultimately repurposed for energy use. Sustainability criteria for biomass used for non-energy purposes remain absent, undermining a holistic approach to setting sustainability standards for renewable energy sources. Additionally, the challenge of ensuring compliance with sustainability criteria for biomass imported from third countries needs to be addressed. One of the small steps in this regard is Regulation 2023/1115 on

deforestation. On the other hand, the cultivation of energy biomass is a frequently discussed topic at both national and international levels, with increasing emphasis on the complexity and efficiency of green infrastructure as a matter of public interest. This involves utilizing additional available areas within municipalities, which play a significant role in the territorial system of ecological stability. By selecting suitable plant species, this approach promotes biodiversity conservation. Additionally, biomass energy can stimulate the local economy by creating jobs, supporting the municipality's sustainable growth, and promoting the principles of urban agriculture development. In this context, biomass energy becomes a vital instrument for achieving sustainable development goals and ensuring efficient local resource management.

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