The Use of Sustainability Criteria

In the Case of the EU Legislation on Biofuels in the Transport Sector

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In the Case of the EU Legislation on Biofuels in the Transport Sector

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3 October 2016

- Licentiate Thesis -

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[1] Further information about LETS can be found at www.lets2050.se, last accessed 31-08-2016.
[2] Further information about NELN+ can be found at http://www.nordforsk.org/en/programs/prosjekter/nordic-environmental-law-governance-and-science-network, last accessed 31-08-2016.

ABSTRACT

In the licentiate thesis, it is researched and analyzed how sustainability criteria may be used in a legal framework, with the purpose to promote and safeguard sustainable products and their production. The research and analysis are conducted on the basis of the EU approach to use sustainability criteria for biofuels in the transport sector, legally expressed in Directive 2009/28/EC, and its amendments in Directive 2015/1513. The licentiate thesis is presented in the form of a compilation. It includes five independently written and published in international journals papers, which deal with different aspects of the researched problem, and the "main body" of an analytical and summarizing character. The "main body" of the licentiate thesis provides answers to the purpose of the research and its supplementary objectives, which are formulated in the introduction.

The results of the research indicate that sustainability criteria, if not designed, implemented and enforced in a satisfactory manner, may miss their aim, and even lead to negative effects. For example, they may fail to guarantee the sustainable quality of the product they address. They may result in substantial economic and administrative losses. They may cause conflicts with other laws, agreements, and the regulations of the World Trade Organisation (WTO). They may lead to unforeseen side-effects that are difficult to steer. Mechanisms promoted to control the fulfillment of sustainability criteria may fail in their function, and result in unwanted complications and insecurity. Regulations aimed to support the implementation of sustainability criteria may be difficult to follow for an average producer. However, the positive potential of using sustainability criteria in legal frameworks is high. The performance of this legal tool depends much on individual conditions in each particular case.

Some general patterns for the use of sustainability criteria in legal frameworks may be worked out. Thus, the aim of using sustainability criteria should be explicitly formulated. It is advisable that this aim is connected to how the concepts sustainable development, sustainability and environmental protection are interpreted in the industry sustainability criteria are made for. The scope of issues that sustainability criteria regulate, in compliance with the formulated aim, should be clearly outlined. A quantitative environmental goal that reflects in what amounts the sustainable product should be manufactured, without damaging the environment, may be established.

Sustainability criteria should not be seen as the only possibility for dealing with environmental challenges. There is a variety of other legal means and governance approaches that may be used with similar purposes, such as eco-labels and eco-design of products. Sustainability criteria should rather be treated as an alternative solution, which may be used in combination with them or alone. The outcomes of the research may be shared by industries and countries that wish to use sustainability criteria. The ideas developed in the licentiate thesis may be interesting not only for legal scholars and practitioners of law, but also for representatives of natural and sustainability sciences. It is valuable to continue and deepen the research on sustainability criteria, for example by adding elements of a comparative analysis.

Key words: environmental law, EU energy law, sustainability criteria, sustainable development, environmental protection, transport biofuels, Directive 2009/28/EC, Directive 2015/1513.

PAPERS INCLUDED IN THE LICENTIATE THESIS

The licentiate thesis is based on five papers published in international peer-reviewed internet-accessed journals. The complete text of the papers may be found attached at the end of this work. The papers are reprinted with the kind permission of the responsible journals in the following order:

1. Pavlovskaia, E. (2013), *Sustainability of transport biofuels from a legal perspective*, International Journal of Environmental Protection and Policy, vol. 1, issue 4, 2013, pp. 88 – 93.

2. Pavlovskaia, E. (2014), *Legal Analysis of the EU Policy for Sustainable Transport Biofuels*, Environment and Ecology Research, vol. 2, issue 2, 2014, pp. 60 – 75**.**

3. Pavlovskaia, E. (2014), *Legal Analysis of the European Union Sustainability Criteria for Biofuels*, Journal of Sustainable Development Law and Policy, vol. 3, issue 1, 2014, pp. 4 – 21.

4. Pavlovskaia, E. (2015), *Development of the EU Approach to Sustainable Biofuels after Directive 2009/28/EC*, Current Research Journal of Commerce and Management (CRJCM), vol. 1, no. 3, 2015, pp. 54 – 61.

5. Pavlovskaia, E. (2015), *Analysis of the Main Innovations in Directive 2015/1513 on Renewable Energy*, Renewable Energy Law and Policy Review (RELP), vol. 6, issue 4, 2015, pp. 294 – 300.

TABLE OF CONTENT

1. INTRODUCTION

1.1 Background to the Research

It is generally recognized that the environment reacts according to natural laws, not according to legal documents people create.[3] Our social and economic development, as well as supporting legislation should be adopted to the laws of nature, so that the progress of our society does not result in an environmental collapse.[4] Economic and production processes should not damage the existing environmental conditions at the local, regional or global levels. Instead, they should be adapted to the carrying capacity of the Earth's biosphere and ecosystems, which is limited.[5]

Much work has already been done to construct legal frameworks that are aimed to protect environment, and preserve the existing environmental conditions. The use of various legal tools[6] has been practised in environmental law, in order to facilitate the achievement of important environmental goals. There is an experience of setting environmental quality norms, making environmental impact assessments, planning industrial activities, and emissions trading. Sustainability criteria may be seen as one of the promising legal tools in this respect, having the potential to promote and safeguard environmentally sustainable products and their production. Not only sustainability criteria may be used for this purpose. Other binding and soft measures, or their combinations, may be recommended, such as sustainability standards and certifications, eco-labels, eco-design, and requirements to utilize bi- and rest products. From this list, sustainability criteria have been chosen as the topic for the present investigation.

The research and analysis conducted in the licentiate thesis indicate that sustainability criteria, if not designed, implemented and enforced in a satisfactory manner, may miss their purpose, and lead to negative effects. For example, they may fail to guarantee the sustainable quality of the product they address. They may result in substantial economic and administrative losses, and not prevent from damaging the environment. They may cause conflicts with other laws, agreements, and the regulations of the World Trade Organisation (WTO). They may lead to unforeseen side-effects that are difficult to steer. They may create uncertainty among the actors, whom they address, and consequently reduce investments. Mechanisms promoted to control the fulfillment of sustainability criteria may fail in their function, and result in unwanted complications and insecurity. Regulations aimed to support the implementation of sustainability criteria may be very difficult, or even impossible to follow for an average producer. In the opinion of the author of the licentiate thesis, the named problems and potential difficulties do not necessarily mean that sustainability criteria as a legal tool are inferior, or insufficient, or should not be applied at all. This scientific area calls for further research and development.

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[3] WCED, World Commission on Environment and Development (1987), *Our Common Future* calls for keeping human activities "in harmony with the unchanging and universal laws of nature", see WCED, World Commission on Environment and Development (1987), *Our Common Future*, Oxford, Chapter 12, 5.80, p. 330; Nilsson, A., K. (2011), *Enforcing Environmental Responsibilities*, Uppsala University, Sweden, p. 31.

[4] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 7.

[5] Aras, G., Crowther, D. (2009), *Corporate Sustainability Reporting: A Study in Disingenuity?*, Journal of Business Ethics 2009, 87, Springer, p. 280.

[6] Referring to the concept "legal tools", the author of the research does not mean that environmental law should be viewed as a tool box, see for example the reasoning in Fisher, E. (2001), *Unpacking the Toolbox: Or Why the Public/Private Divide is Important in EC Environmental Law*, Public Law and Legal Theory, Florida State University, College of Law. However, the repeating use of certain legal instruments in legal frameworks, with positive effects on the achievement of the set environmental goals may be observed.

1.2 Purpose

The purpose of the licentiate thesis is to research and analyze how sustainability criteria may be used in a legal framework, in order to promote and safeguard sustainable products and their production. The research and analysis have been conducted using the EU legal framework for biofuels in the transport sector as an empirical example. To achieve the purpose of the licentiate thesis, four supplementary objectives have been formulated. They are:

1. to identify, delimit and systematize the EU approach to use sustainability criteria for biofuels in the transport sector;
2. to distinguish the main components and sub-elements in the EU approach, applying Westerlund's model of a legal framework as a steering mechanism;
3. to research and analyze the distinguished main components and sub-elements of the EU approach, applying Westerlund's model; and
4. to reflect what may be learned from the EU experience to use the sustainability criteria for biofuels in a legal framework.

The first supplementary objective has been achieved in the research conducted in the included papers. The second and third supplementary objectives have been achieved in the deepened analysis in chapter 3 "Analysis of the EU Approach" in the licentiate thesis. The fourth supplementary objective has been achieved in the reflections in chapter 4 "Summarizing Reflections". To achieve the second supplementary objective, two main components of the EU approach to use the sustainability criteria for biofuels in the transport sector have been singled out and analyzed. They are the EU policy on sustainable biofuels, and the construction of the EU legal framework with sustainability criteria. The first main component concerns the goals, content and limitations of the EU approach to use the sustainability criteria for biofuels. To get a deeper and more precise understanding of the EU approach, the focus is put here not only on the EU regulations in Directive 2009/28/EC, and the amendments in Directive 2015/1513, concerning the sustainability criteria for biofuels, but also on the related policy documents, proposed governance measures, and the EU vision of how its transport sector should be developed.

It has been distinguished in the licentiate thesis that the second main component of the EU approach includes three sub-elements, which are (a) the environmental target, (b) sustainability criteria, and (c) mechanisms to control the fulfillment of the sustainability criteria, also called control mechanisms in the text. The main components and sub-elements have been distinguished according to their relevance and importance for the EU approach to function as it has been initially planned, as well as their contribution to the use of the EU sustainability criteria in the legal framework. These components and sub-elements help to structuralize and analyze how the EU sustainability criteria for biofuels function, with the purpose to promote, support and safeguard sustainable biofuels and their production.

To achieve the fourth supplementary objective, more generalizing and summarizing reflections on the use of the main components and sub-elements of the EU approach have been made in chapter 4 "Summarizing Reflections". The content of chapter 4 highlights challenges and difficulties that a legal framework with sustainability criteria may experience, and suggests possible solutions.

1.3 Model for the Analysis

To research and analyze the identified, delimited and systematized empirical material, the model of Westerlund that views a legal framework as a steering mechanism has been chosen in the licentiate thesis. The model has been slightly modified, in order to reflect the special features of the EU approach to use the sustainability criteria for biofuels.

1.3.1 The Model of Westerlund

Staffan Westerlund was a prominent representative of the Swedish research tradition. He was professor in environmental law at Uppsala University. His research had its focus on the conceptualization of environmental law, and development of special research methods for this field. In his works, which reflected the perspective of the legislator, Westerlund underlined that a legal framework should be constructed and implemented in such a way that it corresponds to its initial purpose.[7] According to him, an efficient legal framework is a legal framework that functions as intended by its constructors, and which leads to the achievement of the intended results. The degree of efficiency can vary depending on how the results, which the legislation achieves, answer the initial purpose of the legislation.[8] The basic challenge for a legal framework is to induce the involved actors to act according to the initial purpose of the legislation.[9] This is not an easy task, since the involved actors can be influenced by other factors, such as their own profit. They can act without preserving environmental interests. They can also lack knowledge about what is good for the environment.[10]

Westerlund suggested that the solution to the basic challenge of a legal framework should be legally *technical* (the italics of the author of the licentiate thesis), which sets demands on the construction of a legal framework. Thus, the environmental goal of a legal framework should be clear. This goal should reflect the exact results, which are aimed at.[11] The goal should be precisely formulated, so that different groups of the involved actors understand it.[12] It should then be operationalized, which means that it should be converted into rules that tell different groups of the involved actors what they should or should not do, in order to achieve the environmental goal. Westerlund called these rules "action rules".[13] Their fulfillment should be controlled.[14] He emphasized that without an operationalization system, the environmental goal does not add much to environmental sustainability and protection.[15]

The next stage, according to Westerlund, is to make the involved actors follow the legislated action rules.[16] This can be achieved with the help of the already established legal tools and mechanisms, for example planning, probation, supervision, consultations and penalty

[7] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 56. Since the original book of Westerlund, which contains the chosen model, and its description is in Swedish, the ideas of Westerlund are presented here in the personal translation of the author of the licentiate thesis.
[8] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 56.
[9] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 56.
[10] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 57.
[11] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 42.
[12] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 58.
[13] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 59.
[14] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 43.
[15] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 70.
[16] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 59.

regulations.[17] Westerlund called rules, which function for the implementation and enforcement of these legal tools, and consequently for the fulfillment of action rules, "enforcement rules".[18]

As an example provided by Westerlund, a businessman should not be bound by general regulations about the environmental goal, but only by the rules that address his actions.[19] Authorities that answer for the implementation and enforcement of action rules should be bound by the environmental goal.[20] This implies that authorities should create rules that are relevant for the businessman and regulate his behavior.[21] Westerlund depicted his model in the following way:

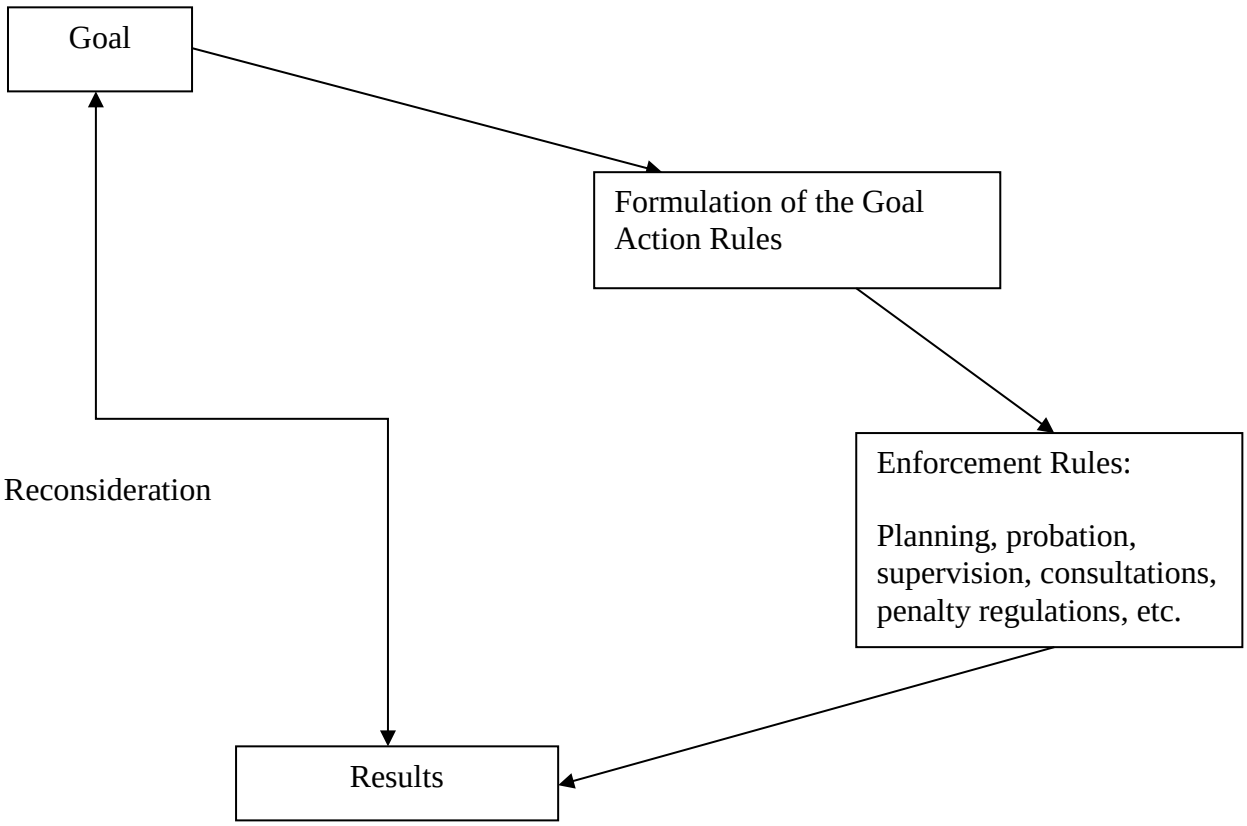

Figure 1. The Model of Westerlund

Figure 1 demonstrates how an environmental goal may be achieved in a legal framework. Westerlund called this process "legal operationalization".[22] He stressed that the relationship between the achieved results and the environmental goal, named "reconsideration" on the figure[23] is important, because there should always be reflections and reconsiderations regarding

[17] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 60.
[18] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 60.
[19] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 44.
[20] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 44.
[21] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 45.
[22] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 95.
[23] The Swedish word is "återkoppling" in the original text, see Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*.

the achieved results, and what has been aimed to be achieved. Westerlund meant that the efficiency of a legal framework has a decisive impact on the fulfillment of the environmental goal.[24] Westerlund's model should not be understood as a circle: the goal shall not be influenced by the results, and environmental requirements shall not be lowered, if they have not been fulfilled.[25] In situations of failure to achieve the intended results, other components of the operationalization process, including enforcement tools and mechanisms should be improved.[26] It may be argued that the opinion of Westerlund expressed in the last sentence is not completely correct. For example, the requirements of the environmental goal may be lowered due to other reasons, such as new scientific findings.

Westerlund pointed out that his model makes it possible to research and analyze legal frameworks and their potential effects without awaiting case law and other implementation results relevant for judicial analysis.[27]

Several aspects of Westerlund's model may be critically discussed. Practical attempts of the author of the licentiate thesis to apply this model on the collected empirical material have shown that it may be difficult to make a sharp distinction between action and enforcement rules, using the description of Westerlund. Both action and enforcement rules may be constructed following different patterns and addressing different groups of actors, which makes it difficult to ensure, which category, according to Westerlund, they belong to. The opinion of the author of the licentiate thesis is that it is advisable to make a clearer distinction between action and enforcement rules, because both these categories are important for a legal framework to function as it has been aimed for.

1.3.2 Application of the Model of Westerlund in the Licentiate Thesis

When Westerlund's model is applied on the identified, delimited and systematized empirical material, the opinion of the author of the licentiate thesis is that it is important to pay attention to the EU policy on sustainable biofuels in general, because it creates the ground and frame for using sustainability criteria for this product. It explains why the production of biofuels should be sustainable, and what aspects of sustainability should be prioritized. The EU policy on sustainable biofuels also provides a clear strategy and tools for promoting and safeguarding sustainability in the biofuel industry, though it may be argued whether the suggested measures are enough to achieve the intended results. The EU policy leaves much space to the process of rethinking, reassessment and reconsideration of the achieved results, in order to improve the function of its legal framework, and the sustainability criteria it includes. Due to these reasons, the first part of the analysis of the EU approach in the licentiate thesis is devoted to the analysis of the EU policy on sustainable biofuels, stressing such issues as the impressions on the EU policy, the EU future vision, the most relevant EU legal regulations, and challenges of advanced biofuels.

The second part of the analysis of the EU approach in the licentiate thesis addresses the construction of the EU legal framework with the sustainability criteria for biofuels. This part of the analysis is carried out using Westerlund's model. It highlights the main components and sub-elements, which are promoted and used in the EU legal framework to support the implementation and enforcement of the EU sustainability criteria. Among them, the

[24] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 40.
[25] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 60.
[26] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 68.
[27] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 69.

environmental target, the sustainability criteria, and the mechanisms to control the fulfillment of the sustainability criteria have been distinguished.

Figure 2 shows that the environmental target in the EU approach, which is the 10 % use of renewable energy in the transport sector by 2020, corresponds to the component "Goal" in Westerlund's model. The sustainability criteria in the EU approach may be referred to the component "Action Rules" in Westerlund's model, implying that different groups of the involved actors, and primarily biofuel producers, should follow the content of the legislated sustainability criteria, and fulfill them. The formulation of the environmental goal at this level may be stated as "Sustainability Criteria and Their Fulfillment". In the subsequent analysis, the scope of this component is reduced to the notion of the sustainability criteria in the EU approach, without specifying the environmental goal for different groups of the involved actors. Within the content of the component "Enforcement Rules" in Westrelund's model, the author of the licentiate thesis has chosen to analyze the mechanisms to control the fulfillment of the sustainability criteria, since they have shown to contain weaknesses that could hamper the implementation and enforcement of the sustainability criteria. Following the argumentation of Westerlund, even other enforcement rules may be distinguished in the EU approach, like planning beforehand, and consultations with various groups of the involved actors.

Schematically, if Westerlund's model is applied on the identified, delimited and systematized empirical material in the licentiate thesis, it may take the following content:

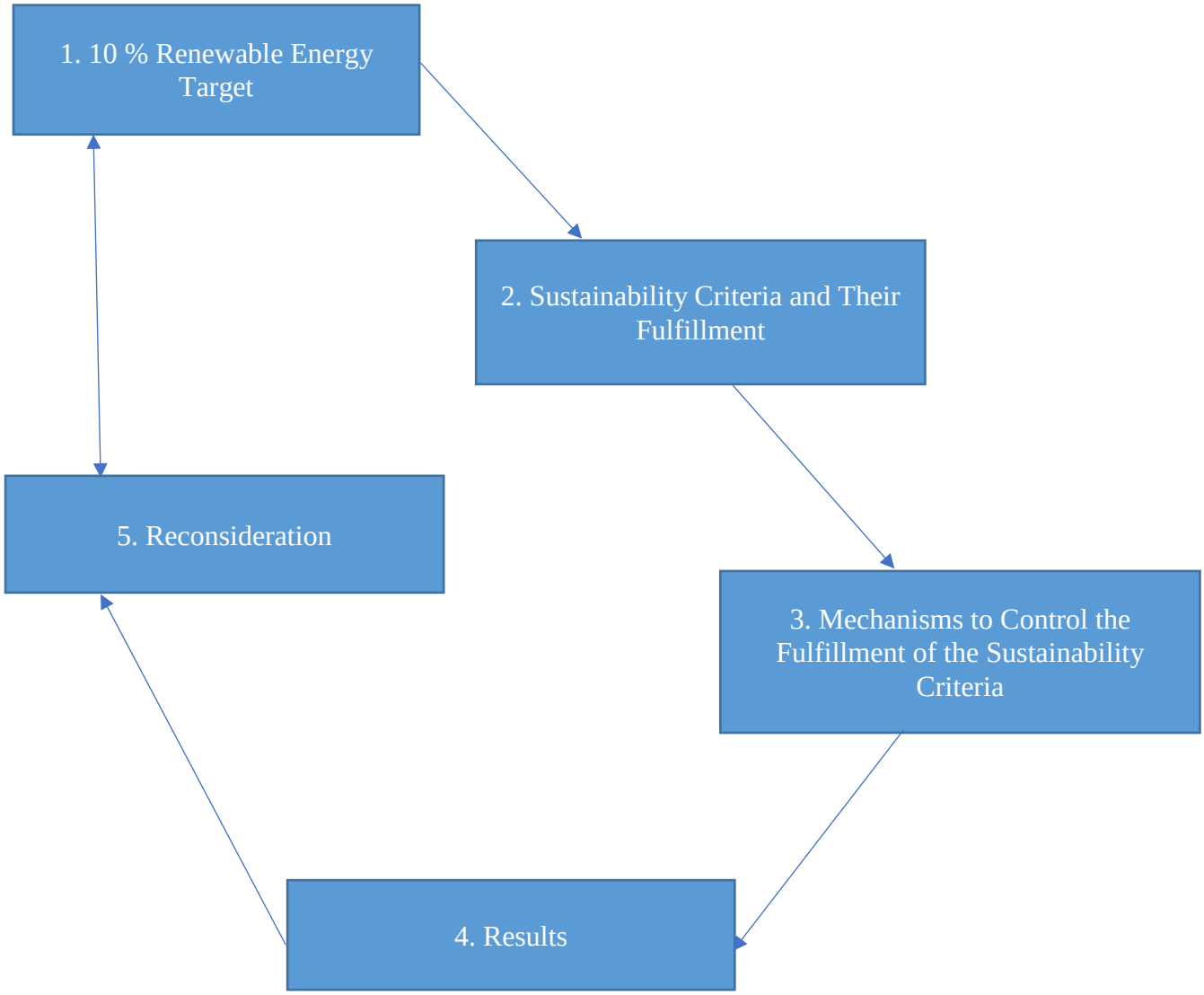

Figure 2. The Model of Westerlund Applied on the EU Approach to Use the Sustainability Criteria

The content of the fourth and fifth boxes on this figure is left almost unchanged in comparison to Westerlund's model. This part of the figure stresses the importance of working at the achieved results, with the purpose to improve the existing approach, and to make it more efficient regarding the achievement of the initial environmental goal. The experience of EU to use the sustainability criteria for biofuels illustrates additionally that the initial environmental goal may be discussed and modified, in order to be more sustainable and realistic.

1.4 Method

From the very beginning of the research, much focus has been put on its scientific and practical relevance. It has been very desirable that the central aspects of the research and the achieved results would be interesting and needful for various types of readers, including legal scholars, natural scientists, and those who are engaged in making sustainable products. The ambition has also been to contribute to the development of sustainability criteria as a legal tool. Considering

this, and the rapidly developing character of the research topic, the form of a licentiate thesis by compilation has been chosen. The advantages of doing so have been many. The ongoing publication of the papers in international journals during the completive period of the research has made it possible to follow without delays international discussions on the difficulties and challenges of using sustainability criteria in a legal framework, on sustainable biofuels in the transport sector, and on the EU approach to use the sustainability criteria for biofuels. It has helped to get quick and essential response from the international audience outside the Law Faculty at Lund University about the relevance and importance of the preliminary research results.

For different stages of the research, which have taken place in the licentiate thesis, different research methods have been applied. Departing from Westerlund's model, and its application on the EU approach to use the sustainability criteria, the process of the research in the work may be divided in four main stages, which basically reflect the four supplementary objectives in the licentiate thesis. The process of the research is schematically illustrated on figure 3.

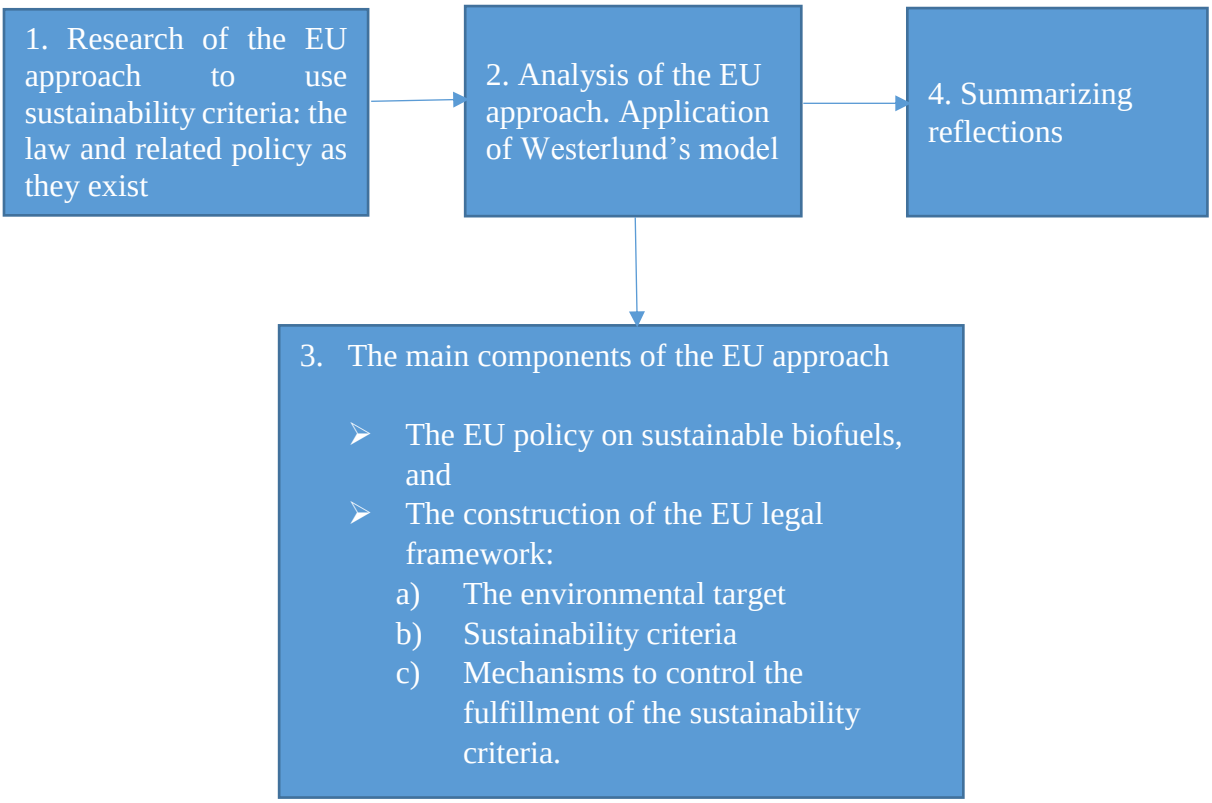

Figure 3. The Research Process Conducted in the Licentiate Thesis

As can be seen, the figure consists of four connected boxes. The first box corresponds to the first supplementary objective in the licentiate thesis. It concerns the initial stage of the research of the EU approach to use the sustainability criteria for biofuels, which has been conducted in the included papers. Within the frames of this box, the EU legal regulations on the sustainability criteria, and related EU policy have been identified as they are, and then delimited and systematized. It may be affirmed that the first box deals with the research of *lex lata* in its broader understanding, i.e. the research of the law as it exists, together with the most important policy documents and measures.

At this stage of the research, the traditional judicial method in its broader meaning has been applied. This method can be described as "rule-oriented", which typically involves systematic research of a legal rule, or a system of legal rules.[28] The method suggests that relevant facts are obtained from valid sources of the existing law, and worked up according to special methodological principles.[29] The application of the traditional judicial method in the licentiate thesis has meant that the needed data on using the EU sustainability criteria for biofuels have been gathered from the relevant sources of the EU law.[30] This stage of the research has had its focus on the determination of the valid law, which has included understanding the relationship between different rules, which are essential for the EU sustainability criteria to function as they

[28] Westberg, P. (1992), *Avhandlingsskrivande och val av forskningsansats – en ide om rättsvetenskaplig öppenhet*, in red. Heuman, L. (1992), *Festskrift till Per-Olof Bolding*, Norstedts Juridik AB, pp. 423 – 425.
[29] Pettersson, M. (2006), *Legal Preconditions for Wind Power Implementation in Sweden and Denmark*, Luleå University of Technology, a licentiate thesis, p. 3.
[30] For more information see section 1.5 "Used Material" below.

should, and their position in Directive 2009/28/EC, and in the EU policy on using renewable energy in the transport sector.

The second box has its focus on more structured and deepened analysis of the EU approach to use the sustainability criteria for biofuels. The scope of the analysis is specified in the third box on figure 3, which after the application of Westerlund's model points out and highlights the main components and sub-elements of the EU approach to use the sustainability criteria for biofuels, as they have been named and explained in the previous sections. The second box corresponds to the second supplementary objective in the licentiate thesis, while the third box reflects the fulfillment of the third supplementary objective. The second and third boxes are closely connected. They represent the middle and more developed stage of the research. Regarding the sub-element (c) in the third box, which deals with mechanisms to control the fulfillment of the sustainability criteria, it may be added that mechanisms to control the fulfillment of the 10 % EU environmental target in its transport sector may also be distinguished. They are included in Directive 2009/28/EC, but their analysis lies outside the scope of the research topic.

At this stage of the research, much advantage has been taken from the research method suggested by Westerlund. This method is grounded in the idea that the efficiency of law should be researched in relation to the aim the law has, or should have.[31] More exact, the effects that a legal framework has, should be researched in relation to the effects that this framework has been aimed to have, or should have had.[32] It has implied that the content of the included papers has been thoroughly analyzed in relation to the components of Westerlund's model, and the results of its application on the EU experience.

The fourth box corresponds to the fourth supplementary objective in the licentiate thesis. It addresses the final stage of the research, which is reflective and summarizing by its nature. It underlines issues, which the future use of sustainability criteria in legal frameworks should take into consideration. At this stage, some features of the method of generalization of the achieved results may be observed. The generalization in the licentiate thesis goes further than the research and analysis of the EU approach to use the sustainability criteria. It provides more knowledge and understanding of this legal tool. It helps to improve the performance of legal frameworks with sustainability criteria, and extend their use in environmental law.

To sum it up, the process of the research in the licentiate thesis has not been linear or straightforward. It has had an iterative character, going back and forth. It has not included any quantities, numerical values or measurements. It has not been quantitative to its nature. The whole research approach may be called "an inductive qualitative research", which has been directed at achieving a deep, well-grounded and valid understanding of how sustainability criteria may be used as a tool to promote and safeguard sustainable products and their production in a legal framework. It has encompassed moving from the research and analysis of the specific empirical example of EU to broader reflections and conclusions, which may be relevant for the use of sustainability criteria in other circumstances and industries.

[31] Thorough explanations and reflections upon this method can be found in Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*. More specifically see p. 56 in this book.
[32] Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*. Particularly see p. 56 in this book.

1.5 Used Material

The purpose of the research and its supplementary objectives have determined what types of material should be collected, researched and analyzed in the licentiate thesis. This approach has required collecting information from a large spectrum of scientific sources. To initially outline and specify the problem of the research, legal documents and doctrine, inter-disciplinary books and periodicals, and reports from countries, independent research groups, environmental agencies and companies about environmental law, environmental protection, sustainability, energy law and renewable energy have been studied.

The subsequent application of the traditional judicial method in its broader meaning has delimited the choice of the most relevant legal material, which has mainly included different sources of the EU law. Directive 2009/28/EC, in its property of the EU secondary law source,[33] has become the central legal document for the research and analysis. It has been complemented by the study of other important EU secondary law sources, for example Directive 2009/30/EC, and the EU primary law sources, namely the Treaty on the European Union (TEU), and the Treaty on the Functioning of the European Union (TFEU). Other non-binding sources of the EU secondary law, not named in Article 288 TFEU, such as the EU staff working documents, communications from the EU Commission to the Council and the European Parliament, the EU reports of different types, for example reports from the EU Commission and the EU Member States, impact assessments, and white and green papers have also been explored.

The EU supplementary sources of law have been partially considered. The case law of the European Court of Justice (ECJ) has been examined, but not included in the licentiate thesis, because there has not been much relevant ECJ praxis at the moment of the research. The commonly accepted concepts and principles of the international and environmental law, for example sustainable development, the precautionary principle and transparency to the public, have been reflected upon. Even relevant WTO regulations have been analyzed, though this area of research has been postponed till the future investigations. The application of the traditional judicial method in its broader meaning implied that the information from the relevant sources of the EU law, legal books and journals have been systematically enriched by scientific reports of different types.

Sources from other connected disciplines, such as environmental and political sciences, which have had relevance for the purpose of the research and its supplementary objectives, have been explored. Facts and technical guidance about biofuels in the transport sector and their sustainable production have been added. Sources relevant for the methodological framework of the licentiate thesis, containing literature about various research methods and theories have been studied to the needed degree.

1.6 Delimitations

Following the purpose of the research and its supplementary objectives, several delimitations have been made in the licentiate thesis.

Firstly, including sustainability criteria in a legal framework can lead to conflicts with the already existing laws, regulations and agreements at the national, regional and international levels. Restrictions from the neighboring spheres of law and different competing interests can

[33] See the legal acts of EU, named in Article 288 of the Treaty on the Functioning of the European Union (TFEU).

also interfere. It has been noted that potential conflicts of laws and regulations that exist across different areas and levels can be inherently chaotic.[34] More and more conflicting interests have to be taken into account, which complicates the establishment of new legal frameworks considerably.[35] For sustainability criteria used in a legal framework, including the EU sustainability criteria for biofuels, consistency with the WTO regulations and possibilities to solve conflicts with them are especially important. Despite the urgency and significance of this issue, it has not been addressed in the licentiate thesis. It represents a separate area of research that lies outside the main purpose of this work and its supplementary objectives.

Secondly, the main focus of the research lies on sustainability criteria in their function as a legal tool aimed to promote sustainable products and their production. It has not been the purpose of the licentiate thesis to study the EU law in general. The EU approach to use the sustainability criteria for biofuels is only the chosen empirical example of a prominent and illustrative character. That is why aspects that deal specifically with the EU law, its structure and means to regulate environmental issues have not been included in the licentiate thesis. For example, there is awareness that the EU sustainability criteria for biofuels may have conflicts with the EU competition law that contains restrictions on competition and elimination of competition for the internal market, or a substantial part of it.[36] This issue and other potential conflicts of the EU sustainability criteria for biofuels with the neighboring spheres of the EU law should be taken into account. However, they have not been researched in detail in this licentiate thesis.

Thirdly, the content of sustainability criteria and the scope of their function are influenced by how the concepts of sustainable development and sustainability are interpreted in various industries. The opinion of the author of the licentiate thesis is that it should be clearly defined and explained what is meant by the sustainable quality of a product and its production, judging from the specific conditions in each particular industry. Following the generally accepted understanding of the concepts sustainable development and sustainability, which may be regarded as a combination of economic, environmental and social aspects,[37] the work has been narrowed down to the environmental perspective. This delimitation reflects the strictly environmental character of the research and analysis in the licentiate thesis. Thus, among the main environmental constraints for making a product, there should be considerations on what the Earth's biosphere and ecosystems can bear.

Fourthly, it has been decided not to participate in general theoretical discussions about what makes products and their production environmentally sustainable. It has been viewed as the task of other sciences, not law to do this.[38] The starting point in the licentiate thesis is that the material content of sustainability criteria should be based on the well-grounded and approved outcomes from natural and environmental sciences.

Finally, the research and analysis in the licentiate thesis have concerned the period from 2009, when Directive 2009/28/EC was issued, to 2015, when the amendments in Directive 2015/1513

[34] Kaffka, S., Endres, J. (2011), *Chapter 20: Are Local, State, and Federal Government Bioenergy Efforts Synchronized?*, an affiliation to the Department of Plant Sciences and Director, California Biomass Collaborative, p. 345.
[35] Lundquist, L. (1987), *Implementation Steering, an Actor-Structure Approach*, p. 178.
[36] Articles 101, 102 and 103 of the Treaty on the Functioning of the European Union (TFEU).
[37] The research conducted in the article Pavlovskaia, E. (2013), *Are We There Yet? A Legal Assessment and Review of the Concept of Sustainable Development under International Law*, Journal of Sustainable Development Law and Policy, Afe Babalola University, vol. 2, issue 1, pp. 139 – 152, explains and strengthens this understanding.
[38] Pavlovskaia, E. (2013), *Using sustainability criteria in law*, International Journal of Environmental Protection and Policy, vol. 1, issue 4, p. 77.

came into force. Additional attention has been paid to the development of the EU approach to use the sustainability criteria before Directive 2009/28/EC.

1.7 Disposition

The research has the form of a licentiate thesis by compilation. It consists of five chapters and five attached papers.

Chapter 1 presents the purpose of the research in the licentiate thesis and its methodological framework. It contains sections about the background to the research, the method of the research, the model for the analysis, the material used in the research, and the relevance of the research.

In chapter 2, the content of the five papers included in the licentiate thesis is summarized and explained. The chapter provides the reader with the information necessary for the subsequent analysis of the research material.

In chapter 3, the EU experience of using the sustainability criteria for biofuels in the transport sector is analyzed with the help of Westerlund's model. Two main components and related sub-elements of the EU approach to use the sustainability criteria for biofuels are distinguished and analyzed. For more detailed information, references to the findings in the attached papers, and relevant policy documents of EU are made.

Chapter 4 contains final reflections, with the features of generalization, upon the research results achieved in the licentiate thesis. On the basis of the EU approach to use the sustainability criteria for biofuels, the chapter dwells upon challenges and difficulties that a legal framework with sustainability criteria may generally experience, and suggests possible solutions.

In chapter 5, the main findings in the licentiate thesis are summarized. One of the most important conclusions is that sustainability criteria may be efficiently used as a legal tool, aimed to promote and safeguard sustainable products and their production. Ideas for the future exploration of the research topic are sketched.

At the end of the licentiate thesis, the five papers included in the research are attached.

1.8 Relevance of the Research

Scientific and practical relevance of the research conducted in the licentiate thesis should be stressed separately. The scientific relevance of the research is that it adds to the understanding of how sustainability criteria may be used in environmental law. It contributes to the analysis of the already achieved results, the generation of new knowledge, and the development of more efficient measures to address environmental problems. The research highlights advantages of establishing the connection between an environmental goal, sustainability criteria for its achievement, and mechanisms to control the fulfillment of these components in a legal framework. The research suggests that sustainability criteria should be used more often, due to their high potential to promote and safeguard sustainable products and their production in law.

By this licentiate thesis, grounds have been prepared for the further exploration of sustainability criteria. Future research can be expanded to address the construction and analysis of different

types of sustainability criteria, including economic, environmental and social aspects of sustainable development and sustainability. Comparative research of how sustainability criteria may be used for different products is also a promising opportunity. Another alternative is to analyze and discuss the most appropriate approaches to implement, enforce and control the fulfillment of legislated sustainability criteria.

The practical relevance of the research is that the obtained results may be shared by different legal systems and industries that are interested in sustainability issues. The ideas developed in the licentiate thesis may be useful not only for legal scholars and practitioners of environmental law, but also for researchers within natural and social sciences, as well as for specialists, who are engaged in developing sustainable products and their production.

2. MAIN FINDINGS IN THE PAPERS

In this chapter, the main findings in the included papers are presented. The content of the papers is briefly summarized and explained. Particularly:

Paper 1 provides a background to biofuels in the transport sector, points out their advantages and disadvantages in comparison to traditional fossil fuels, and reflects upon what makes the production of biofuels sustainable.

Paper 2 describes the EU policy for biofuels in the transport sector up till 2010, explains the most important issues in its central legal frameworks, with the main focus on Directive 2009/28/EC, and presents the content of the EU sustainability criteria for biofuels.

Paper 3 analyzes the EU sustainability criteria for biofuels, highlights their strong and weak sides, and discusses the future development of the EU approach to the sustainability criteria.

Paper 4 explores the development of the EU policy for biofuels in the transport sector after Directive 2009/28/EC, within the broader frames of the planned EU policy for renewable energy during the coming decades.

Paper 5 addresses the main innovations in recently adopted Directive 2015/1513. It analyzes the strengths and weaknesses of the amendments in this legal framework, and suggests possible future improvements.

Figure 4 shows the schematic structure of the research conducted in the included papers:

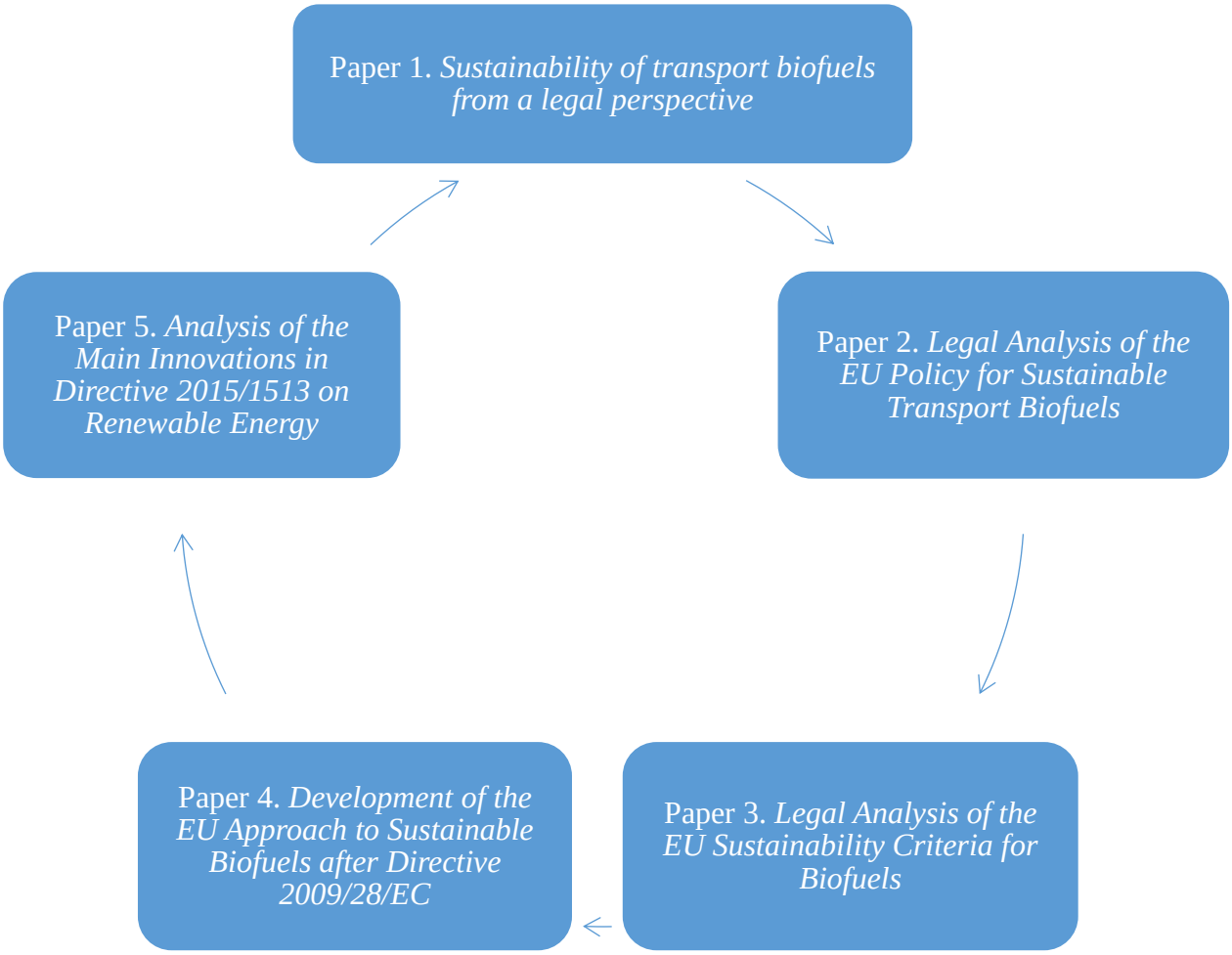

Figure 4. The Research Conducted in the Included Papers

Each box on this figure contains the ordinal number of the paper in the licentiate thesis, and its title. The circular character of the figure reflects that the content of the papers is interconnected.

More detailed, **paper 1**, which has the title *"Sustainability of transport biofuels from a legal perspective"*, creates a picture of what biofuels in the transport sector are, and what makes their production sustainable. It is explained in the paper that there are different types of biofuels, which in a simplified way may be classified as the first generation biofuels, or biofuels of an agricultural origin, and the second generation biofuels, sometimes also called more advanced biofuels. The most widely used types of the first generation biofuels are bioethanol and biodiesel. Examples of the second generation biofuels are biogas and cellulosic biofuels. Many types of biofuels are under development. At present, biofuels of an agricultural origin are dominating the international market. It is expected that this situation would remain in the nearest future.

Possible advantages and disadvantages of biofuels in the transport sector, in comparison to traditional fossil fuels are discussed. For example, there is a risk that production of biofuels will create competition with food markets. Large amounts of additional land, which are needed for biofuels of an agricultural origin, may damage the existing eco-systems and biodiversity. Under these conditions it is very important to safeguard that the quality of produced biofuels is sustainable, and is linked to the carrying capacity of the Earth's biosphere and ecosystems.

The task of law in the case of biofuels in the transport sector may be to contribute to the sustainable development of this industry through the use of traditional and newly emerging legal approaches and tools. Elaboration of sustainability criteria for biofuels, and their use in legal frameworks, with the purpose to promote and safeguard sustainability of this product and its production, become significant. The development of harmonized and widely-accepted definitions of biofuels and their most commonly used types, which are missing today, may be recommended. This would create more order in the biofuel industry, and make the use of the newly introduced concepts easier.

In **paper 2**, which is titled *"Legal Analysis of the EU Policy for Sustainable Transport Biofuels"*, the EU experience of developing a framework with sustainability criteria for biofuels is researched and analyzed. It is explained that the EU policy for biofuels in the transport sector was initiated as early as in 1985. It may be characterized as consequent, encouraging and ambitious. Its central legal framework is Directive 2009/28/EC.[39] This document has set the 10 % binding target for renewable energy in the EU transport sector, which concerns each EU Member State, and is primarily directed at the use of biofuels. The 10 % target for renewable energy shall be achieved by 2020. Directive 2009/28/EC has also introduced sustainability criteria for biofuels,[40] linked to the achievement of the 10 % target for renewable energy: only biofuels that comply with the sustainability criteria may be counted towards it, and receive governmental support.[41]

Though the sustainability criteria for biofuels in Directive 2009/28/EC are few, they may be divided in two main groups, according to their content and purpose. These groups are: (a) the requirements on the savings of greenhouse gases (GHG) emissions caused by the use of biofuels, in comparison to traditional fossil fuels; and (b) the requirements on the land use during the production of energy crops for biofuels. Four types of the sustainability criteria for biofuels may be totally distinguished, the first one belonging to group (a), and the remaining three to group (b):

[39] This information was relevant for the moment of writing paper 2, i.e. for 2014. Today Directive 2009/28/EC should be considered together with the amendments in Directive 2015/1513.
[40] See Article 17 in Directive 2009/28/EC.
[41] Article 17.1 in Directive 2009/28/EC.

1. biofuels shall achieve a minimum level of GHG savings;
2. land with high biodiversity shall not be converted for the production of biofuels;
3. land with high carbon stocks shall not be converted for the production of biofuels; and
4. land that was peatland in January 2008 shall not be used for the production of raw materials for biofuels.

The content of the legislated sustainability criteria is transparent. A EU Member State does not have the right to establish stricter sustainability criteria than these.[42] Biofuels produced from waste and residues need only fulfill the first sustainability criterion for GHG emission savings.[43] Conclusions are made in the paper that the sustainability criteria in Directive 2009/28/EC have not been set for other issues than environmental sustainability.

The attention of the reader is drawn to the fact that initially the EU policy for biofuels in the transport sector has only been directed at its quantitative development. Later, the quality of biofuels has been considered: the sustainability criteria for this product have been formulated in Directive 2009/28/EC. This approach, when the quantity of a product is combined with sustainability requirements for its quality seems to be efficient from the environmental perspective.

An opinion of the author is expressed that it is favorable for EU to have the 10 % target for renewable energy in the transport sector. The fixed timeframe for the achievement of the target creates stability for the producing industry, and provides assurance to investments. The 10 % target for renewable energy facilitates environmental planning, which helps to use natural resources in a cautious and rational way. It regulates the quantity of biofuels that are produced, imported to and used in EU. This is especially important from the environmental perspective: internationally, biofuels should be produced in sound and restricted amounts that are not damaging for the Earth, and the carrying capacity of its biosphere and ecosystems. An unreasonable and spontaneous increase in the production of biofuels may lead to the use of less sustainable production methods, and harm the environment. A gradual and well-planned increase, on the contrary, would help to get advantages from the environmental potential of biofuels. It may be discussed whether the 10 % target for renewable energy should be minimized, for its achievement to be more realistic. Further research and assessments in this area are needed.

The paper underlines that monitoring is an important supplementary element in Directive 2009/28/EC, which facilitates the achievement of the 10 % target for renewable energy, and the implementation and enforcement of the EU sustainability criteria. Among the monitoring mechanisms promoted in Directive 2009/28/EC, there is the requirement of transparency, which states that a certain amount of information should be transparent to the public. To fulfill it, the EU Commission has established an online public Transparency Platform[44] that contains documents of the EU Member States and the EU Commission, relevant for the fulfillment of the regulations in Directive 2009/28/EC, and the EU policy for renewable energy. It may be speculated that the sustainability criteria in Directive 2009/28/EC, as well as the

[42] Article 17.8 in Directive 2009/28/EC.
[43] Article 17.1 in Directive 2009/28/EC.
[44] Before 2014, the Transparency Platform of the EU Commission could be found at http://ec.europa.eu/energy/renewables/transparency_platform/transparency_platform_en.htm. The renewed web-address is http://ec.europa.eu/energy/en/topics/renewable-energy, last accessed 31-08-2016.

implementation, enforcement and monitoring mechanisms for their fulfillment should be developed further.

Paper 3 has the title *"Legal Analysis of the EU Sustainability Criteria for Biofuels"*. It contains a more detailed analysis of the EU sustainability criteria for biofuels from Directive 2009/28/EC. It is underlined in the paper that the EU sustainability criteria should be regarded as a minimum list of criteria, which function in order to ensure rational GHG emission savings, and to avoid major environmental impacts on land use and biodiversity. The paper views the EU sustainability criteria as a legal tool that can be efficiently used to promote, safeguard and implement the concepts of sustainable development and sustainability at the level of an industry. It is specified that the EU sustainability criteria for biofuels are not included in Directive 2009/28/EC alone. They are accompanied by supplementary elements, or mechanisms, which are aimed to facilitate the processes of implementation and enforcement. Among these elements, the requirements to verify compliance with the EU sustainability criteria, and the calculation methodology for the GHG emission savings are named in the paper.

Two sub-sections in the paper are devoted to the analysis of the strong and weak sides of the EU approach to use the sustainability criteria for biofuels. Concerning the strong sides, it is outlined that the content of the EU sustainability criteria is clearly formulated. They are not elusive or dubious. The strict minimum level for GHG emission savings and the land-use requirements, which the EU sustainability criteria have set, are grounded in detailed and reliable scientific data. The EU approach to use the sustainability criteria contains control mechanisms that demand the EU Commission and the EU Member States to report on measures taken to comply with the sustainability criteria, and on their impact on additional sustainability issues. The latter area includes such issues as the increased pressure on food security, developmental tendencies in countries outside EU, respect of land-use rights, and protection of air, soil, water and biodiversity.

The weak sides of the EU approach to use the sustainability criteria for biofuels, found out in the paper, are more numerous. One of the most significant vulnerabilities is that the list of the EU sustainability criteria, and the issues that they regulate are not enough to guarantee the sustainable quality and sustainable production of biofuels. This is a problem that needs to be addressed as soon as possible, because poorly planned, large-scaled and unsustainable production of biofuels may result in soil, water and air pollution. Regulation of these issues is left outside the scope of the EU sustainability criteria.

Indicators and measuring instruments for the three EU sustainability criteria for land use are not cautiously elaborated. For some issues of land use there are scientific data gaps. Cases of the indirect land-use change (iLUC) caused by the production of biofuels is an environmental concern, which has not been addressed by the EU sustainability criteria.[45] This is despite the fact that iLUC may have long-lasting negative impacts on the environment and biodiversity.[46] Estimations of GHG emissions due to iLUC are complex. It is still questionable how

[45] Communication from the EU Commission, COM (2012) 595 final, *Proposal for a Directive* amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources, p. 2.

[46] The same point of view is strengthened in the research of Nastasi, G., see his opinion in Nastasi, G. (2013), *Policy Update: The EC proposal on biofuels: a valid exercise of power?*, Biofuels, 4/2, pp. 151 – 153.

sustainability criteria that address iLUC, and iLUC effects on the environment should be formulated.[47]

Another weak side of the EU approach to use the sustainability criteria for biofuels is in its methodology for calculating GHG emissions. The current calculation method presented in Article 19 of Directive 2009/28/EC has certain flaws. For example, the actual utilization of industrial residues is not included in the calculations. The EU guidelines for calculating GHG emissions should possibly be revised and improved to make sure no misleading incentives are given.

It does not come out from Directive 2009/28/EC and related policy documents to what extent costs for the fulfillment of the EU sustainability criteria, and for proving compliance with them, which in the first turn is the responsibility of the involved producers, have been taken into account by the EU policy-makers. There are other uncertainties regarding the effects of the EU sustainability criteria. For example, there is a risk that biofuels that fulfill the EU sustainability criteria would comprise a small higher price segment of the market, while the uncertified, probably unsustainable biofuels will supply the rest. This means that in spite of the legislated sustainability criteria, the issue of sustainable biofuels and their production would not be resolved.

The paper accentuates that amendments of the EU policy for sustainable biofuels in the transport sector are likely in the future. One of the most important actions to take is to enlarge the list of the legislated sustainability criteria, in order to safeguard the sustainable quality and sustainable production of biofuels. Other criteria that deal with economic, environmental and social sustainability should be added.

As long as the fulfillment of the EU sustainability criteria for biofuels has global impacts, the perspective of the involved actors from the regions outside EU should be taken into account. The role of developing countries should not be underestimated. Practical possibilities of the involved actors and regional special features should be considered. Generally formulated sustainability criteria, as in the EU approach, do not reflect regional special features, such as variations in climate, soil quality, infrastructure and economic development. However, these variations may cause differences in production processes, which would result in implementation difficulties and assessment inconsistencies. It should be recommended that the debate on biofuels preserves an international character.

The introduction of the EU sustainability criteria and special rules of compliance with them may motivate interested actors to develop voluntary sustainability standards in line with Directive 2009/28/EC. It may be advisable to create appropriate conditions for the biofuel market, so that it develops sustainability criteria and voluntary sustainability standards on its own. This may be achieved through a combination of the minimum list of legislated sustainability criteria, and additional voluntary sustainability criteria, included in specially accredited voluntary sustainability standards. To make one-sided references to the EU sustainability criteria in voluntary sustainability standards may be insufficient from the perspective of the environmental protection.

[47] A report from the EU Commission on the issue of iLUC and its challenges, which summarizes the analytical work conducted in this area since 2008, can be found in COM (2010) 811 final, *on indirect land-use change related to biofuels and bioliquids*.

More general conclusions suggest that a list of sustainability criteria, incorporated in a legal framework, should neither be too long, nor too short. A long list is not easy to implement and enforce. For a short list, and the EU approach to use the sustainability criteria for biofuels illustrates this, it may be difficult to guarantee the sustainable quality of a product and its production. Additionally, it is desirable that the legislated list of sustainability criteria is supplemented by non-binding comments, recommendations and guidelines. Before making the suggested sustainability criteria legally binding, potential conflicts between different interests, the already existing frameworks in neighboring spheres of law, and the WTO regulations should be thoroughly researched.

Paper 4 has the title *"Development of the EU Approach to Sustainable Biofuels after Directive 2009/28/EC"*. In it, the most important tendencies in the development of the EU approach to renewable energy in the transport sector, and particularly sustainable biofuels after Directive 2009/28/EC are highlighted and reflected upon. It is stressed that the EU policy on sustainable biofuels in the EU transport sector is constantly developing.

The package of the EU policy documents from 2011 included *the Energy Roadmap 2050*, COM (2011) 885, and *the 2011 White Paper on Transport*, COM (2011) 144. In *the Energy Roadmap 2050*, it was suggested that a mix of several alternative solutions would be needed in the EU transport sector, in order to replace traditional fossil fuels. Sustainable biofuels would probably be the main option for aviation, and long-distance road transport and rail, where it could not be electrified. Work to ensure sustainability in the EU transport sector should be ongoing. The market uptake of new bioenergy, which would reduce demand for land necessary for food production, and which would increase the net GHG savings, such as more advanced types of biofuels based on waste, algae and forest residues, should be promoted further. It is uncertain, which technological options would be developed, at what pace, and with what consequences and trade-offs. Technology was seen in the policy document as an essential part of the solution to the EU decarbonization challenge. Warnings have been made that EU would need to consider progress and concrete actions in other countries. Its policy should not be developed in isolation.

In *the 2011 White Paper on Transport*, it was underlined that the EU transport sector could not develop along the same path in the future. More coherence within the EU transport sector was vital. For example, a situation where one EU Member State opted exclusively for electric cars, and another only for biofuels would destroy the concept of free travel across Europe. The idea was expressed that the EU transport sector, which was a significant and still growing source of GHG emissions, must be sustainable in the light of future challenges. The policy document promoted a non-binding goal to reduce the GHG emissions from the EU transport sector by 60 % by 2050, compared to the emissions in 1990, and by around 20 % by 2030, compared to the level of 2008.

The primary goal of the EU approach to transport was seen in helping to establish a system that would strengthen the EU economic progress, enhance competitiveness, and offer high quality mobility services, while using resources more efficiently. In practice, the EU transport sector had to use less and cleaner energy, better exploit a modern infrastructure, and reduce its negative impacts on the environment and key natural resources. The policy document accentuated that it was important to transform EU into a resource-efficient, low-carbon economy. This would require full delivery of the EU climate and energy package to achieve the 2020 renewable energy targets, and the agreement on the next steps for climate policy beyond 2020.

Setting up more focus on sustainable biofuels and Directive 2009/28/EC, *the Renewable Energy Progress Report*, COM (2013) 175, was published in 2013. In it, the EU Commission considered an amendment to the 10 % renewable energy target in the transport sector, requiring more use of the advanced types of biofuels for its achievement. More reliance on these types of biofuels, which were also expected to deliver higher GHG savings than food-based biofuels, would require additional efforts. Complying with the obligations under Directive 2009/28/EC, the EU Commission assessed the implementation, effectiveness and impacts of the EU approach to sustainable biofuels. It summarized that though the EU Member States' implementation of Directive 2009/28/EC was too slow, possible negative impacts of the EU biofuel consumption did not appear to warrant further. The savings of GHG emissions without including iLUC effects, as reported by the EU Member States, were positive.

The 2013 EU Strategy for Alternative Fuels, COM (2013) 17, suggested that a strategic approach for EU to meet the long-term needs of all transport modes must be built on a comprehensive mix of alternative fuels. All options needed to be included, without giving preference to any particular fuel, preserving technological neutrality. It was highlighted that the EU Commission had proposed to limit the amount of food-based biofuels, which could be counted towards the 10 % renewable energy target in the EU transport sector, set in Directive 2009/28/EC, to 5 %. The EU Commission was willing to increase the incentives for the advanced types of biofuels, such as those made from ligno-cellulosic biomass, residues, waste and other non-food biomass, including algae and microorganisms. This was promoted with the purpose to mitigate against possible negative impacts of some types of biofuels. The opinion of the EU Commission was that after 2020 only the advanced types of biofuels should receive public support.

The relevant package of the EU policy documents from 2014 included *a policy framework for climate and energy in the period from 2020 to 2030*, COM (2014) 15, and *Impact Assessment on energy and climate policy up to 2030*, SWD (2014) 15. According to the 2014 policy framework, food-based biofuels should not receive public support after 2020. A range of alternative renewable fuels, and a mix of targeted policy measures would be needed to address the challenges of the EU transport sector in a 2030 perspective, and beyond. Sustainable fuels should be a part of a more holistic and integrated approach. The focus of the development should lie on improving the efficiency of the EU transport sector, and further development and deployment of electric vehicles, and more advanced types of biofuels. Particularly, the EU Commission proposed increased incentives for advanced types of biofuels, which did not need land for their production, such as biofuels made from residues and wastes. The EU Commission meant that in order for the EU transport sector to decarbonize in a cost-effective and sustainable manner, technological development of the advanced types of biofuels was necessary.

In *the 2014 Impact Assessment on energy and climate policy*, it was pointed out that the share of renewable energy in the EU transport sector reached 1,2 % in 2005, and 4,7 % in 2010, compared to the 10 % renewable energy target by 2020 in Directive 2009/28/EC. The EU Member States supported biofuels with the help of mandatory blending obligations in transport fuels, tax exemptions and other support schemes. The EU Commission suggested that various policies underpinning the EU energy and climate targets for 2020 needed to be mutually supportive, and limit inefficiencies as much as possible.

Regarding the position of the EU Parliament, it observed in 2013 in policy document 2012/0288 (COD) *on the amendments to Directive 2009/28/EC*, that the 10 % renewable energy target in

the EU transport sector would be increasingly difficult to achieve sustainably, if the overall demand for energy in the EU transport sector continued to rise. The EU Parliament explained that where grassland, or agricultural land previously destined for food and feed markets were diverted to the production of biofuels, the non-fuel demand should still be satisfied either through intensification of the current production, or by bringing non-agricultural land into production elsewhere.

In April 2015, with reference to the same policy document,[48] the EU Parliament noted that voluntary sustainability standards played an increasingly important role in providing evidence of compliance with the sustainability requirements in Directive 2009/28/EC. Due to this, it would be appropriate to mandate the EU Commission to require voluntary sustainability standards to report regularly on their activity. The reports should be made public, in order to increase transparency, and to improve oversight by the EU Commission. This approach would additionally help to identify best sustainability practices in the biofuel industry. In July 2015, the text of the amendments in new Directive 2015/1513 was approved by the EU Council in its second reading.

The results of the paper underline that the EU work in the energy and transport sectors after Directive 2009/28/EC remains advanced, constructive and ambitious. The EU development, aimed at the promotion of renewable energy, and more sustainable and advanced types of biofuels continues. The EU sustainability criteria for biofuels in the transport sector remain an important tool in achieving this. However, the vision expressed by the EU Commission for a 100 % renewable energy system in EU by 2050 may be unworkable. It may appear aspiring, but not realistically achievable in practice. The anticipations of the EU Commission are that the more advanced types of biofuels would reduce demand for land necessary for food production, and would increase the net GHG savings. Warnings should be made that the issues of sustainability, efficiency and performing potential of the more advanced types of biofuels are unclear.

Paper 5 is titled *"Analysis of the Main Innovations in Directive 2015/1513 on Renewable Energy"*. It is concentrated on the main innovations in recently adopted Directive 2015/1513 on renewable energy and biofuels in the EU transport sector. It analyzes strong and weak sides of this legal framework, and reflects on possible future elaborations of the EU approach to renewable energy and sustainable biofuels in the transport sector. It is stressed in the paper that this development should be in balance with the production of food and non-edible products, as well as with the environmental protection, biodiversity, and the ecological limits of our planet.

In the opinion of the author, Directive 2015/1513 is not likely to resolve the numerous challenges regarding biofuels in the EU transport sector. It might be erroneous to rely much on advanced types of biofuels, such as biofuels made from waste, algae and forest residues: future research might show that it is not realistic to supply the EU transport sector with the desirable amounts of these biofuels, because of the limitations in feedstocks for them. Improvements in the production process are evidently needed for biofuels, in order to increase sustainability of their production volumes and quality.

More exact, after Directive 2009/28/EC came into force, it became noticeable that in spite of the sustainability criteria and other measures of caution, introduced in this Directive, the production of biofuels, and specifically food-based biofuels of an agricultural origin, could lead

[48] Procedure 2012/0288 (COD), *on the amendments to Directive 2009/28/EC*, related to COM (2012) 595 final.

to considerable negative effects. The displacement of existing agricultural activities to new geographic territories, which could result in unsustainable iLUC cases, became one of them. It was recognized that iLUC could generate significant GHG emissions, but it appeared difficult to set legal requirements to control iLUC cases and their effects, because these issues could lie beyond what was practically and technically possible to control for an ordinary biofuel producer.

To deal with these and other prominent challenges of the biofuel production, further elaboration of Directive 2009/28/EC was started. The final compromise on the amendments to Directive 2009/28/EC, in the form of Directive 2015/1513, was reached in spring 2015. It was agreed to preserve the 10 % target for renewable energy in the EU transport sector. However, the contribution to this target of food-based biofuels, and biofuels from other crops grown on agricultural land was capped at 7 %.[49] The remaining 3 % of renewable energy should come from a variety of multiple-counted alternatives, such as biofuels from used cooking oil and animal fats, counted two times,[50] or advanced types of biofuels, counted two times.[51] It was emphasized that the EU Member States shall seek to achieve a minimum proportion of food-based biofuels, and other biofuels, listed in amended Annex IX, part A, which would be consumed on their territory.[52] To that effect, each EU Member State shall set an indicative national sub-target for advanced types of biofuels that it shall endeavor to achieve. The reference value for this sub-target is 0.5 % points in energy content, counting from the share of renewable energy in all forms of transport by 2020. The EU Member States may set a national target lower than 0.5 % points under certain conditions.[53] They shall establish the level of their national indicative sub-targets for advanced types of biofuels by 6 April 2017.[54] The list of the sustainability criteria for biofuels, set out in Article 17 of Directive 2009/28/EC was not changed.

As far as the improvements of the EU control mechanisms are concerned, voluntary sustainability standards, accepted by the EU Commission, would be controlled more. For example, the benchmarked voluntary sustainability standards shall regularly, and at least once per year, publish a list of their certification bodies, used for independent auditing. They shall indicate for each certification body, by which entity or national public authority it was recognized, and which entity or national public authority is monitoring it.

On the one hand, the amendments in new Directive 2015/1513 may be seen as a step forward towards a more comprehensive and consistent legal framework for renewable energy and biofuels in the EU transport sector. They started the transition from food-based biofuels, which have a controversial environmental impact, to more advanced types of biofuels. It is supposed that the latter types of biofuels would be more sustainable, and would deliver savings of GHG emissions. Directive 2015/1513 is expected to contribute to making the investment climate more secure. It should bring legal certainty that is needed for further innovative research.

On the other hand, there are doubts whether Directive 2015/1513 would be satisfactory from the perspective of environmental sustainability. The EU approach did not investigate how the involved actors could reduce iLUC, and its possible negative effects. The amendments did not

[49] Amended Article 3.4.d in Directive 2015/1513.
[50] Amended Annex IX, part B in Directive 2015/1513.
[51] Amended Article 3.4 in Directive 2015/1513.
[52] Amended Article 3.4.e in Directive 2015/1513.
[53] Amended Article 3.4.e in Directive 2015/1513.
[54] Amended Article 3.4.e in Directive 2015/1513.

consider tools aimed at improving land use planning and enhancing practices of land use, such as utilization of degraded lands. Instead, the role of food-based biofuels, and biofuels from other crops grown on agricultural land was reduced, with the purpose to avoid iLUC cases. To support this approach, it may be highlighted that the scientific knowledge about iLUC is too vague and unclear for law-making. There is no scientific consensus on how to deal with this issue, and to measure its effects. Warnings should be made that iLUC cases may cause profound disagreements between the EU Member States. In general, Directive 2015/1513 leaves many issues up to the EU Member States to decide, which may result in a diverging implementation of this legal framework at the national level, and a fragmented EU market for biofuels.

Particularly, the solution to have the cap of 7 % on the contribution of food-based biofuels, and biofuels from other crops grown on agricultural land may be seen as unnatural and controversial. It is a political compromise that would have impacts on the ordinary development of the biofuel industry. It is uncertain in what amounts the remaining 3 % of renewable energy from advanced types of biofuels could be delivered, and what sustainability effects this would have. It may become difficult for the EU Member States to achieve this part of the 10 % renewable energy target, because of the insufficient commercial availability of advanced types of biofuels.

The paper finally recommends that feedstocks for biofuels should be utilized in the most responsible and resource-efficient ways. Land for biofuels of an agricultural origin should be carefully chosen, in order to reduce negative impacts on biodiversity, eco-systems and water resources. Since hopes for the future of the EU transport sector are resting on the use of advanced biofuels, an important task would be to develop sustainability criteria for these types of biofuels and their production.

3. ANALYSIS OF THE EU APPROACH

3.1 Introduction

In the included papers, the EU approach to use the sustainability criteria for biofuels in the transport sector has been identified, delimited and systematized. In this chapter, more structured and deepened analysis of the EU experience is presented. The chapter starts with the analysis of the two main components and referring sub-elements of the EU approach to use the sustainability criteria for biofuels in the transport sector. The chapter is rounded off with the reflections upon the lessons that may be learned from the EU experience.

On the basis of the identified, delimited and systematized empirical material, and the application of the model of Westerlund, two main components and three sub-elements of the EU approach to use the sustainability criteria for biofuels in the transport sector have been distinguished. The two main components are the EU policy on sustainable biofuels, and the construction of the EU legal framework with sustainability criteria. The second main component includes three sub-elements, which are (a) the environmental target, (b) sustainability criteria, and (c) mechanisms to control the fulfillment of the sustainability criteria. The main components and referring sub-elements reflect the aspects that are most important for the EU approach and the legislated sustainability criteria for biofuels to function as they do, according to the opinion of the author of the licentiate thesis.

3.2 The EU Policy on Sustainable Biofuels

In this sub-section, the sub-elements that constitute the EU policy on sustainable biofuels are analyzed.

3.2.1 Impressions on the EU Policy

The EU policy on sustainable biofuels in the transport sector, being a part of the more ambitious EU policy on sustainable renewable energy,[55] seems to be consequent, coherent and thoroughly planned.[56] It has a long history. It is an instructive example of how the concepts of sustainable development, sustainability and environmental protection may be legally implemented and enforced in a particular industry.[57] Being one of the areas with the highest priority in EU, the EU policy on sustainable biofuels is constantly developing.[58] It has significant global influence.[59]

The EU policy on sustainable biofuels may be characterized as well-functioning and competitive. It involves much international collaboration.[60] To the mind of the author of the licentiate thesis, it is advantageous that the EU Commission has recognized that the EU policy in the transport sector should not be developed in isolation, and that the EU cooperation with other regions and countries in this area should be promoted and strengthened.[61] At the same

[55] Papers 2 and 3.
[56] Paper 2.
[57] Paper 2.
[58] Papers 2, 3 and 4.
[59] Papers 2 and 3.
[60] Papers 2, 3 and 4.
[61] Paper 4.

time, the EU work at sustainable biofuels and their production is important for the reduction of the EU dependence on foreign energy imports, and in meeting renewable energy targets to combat global climate change.[62] It may become problematic, if the EU policy on sustainable biofuels relies much on the imports of biofuels, or biomass for their production from countries outside EU. This strategy may be environmentally unsustainable in the long perspective, because countries outside EU may lack conditions and legislation needed for the sustainable production of biofuels. The EU policy could benefit from encouraging domestic production of sustainable biofuels for transport.[63]

The EU policy on sustainable biofuels calls to reflect on its possible consequences locally, regionally and globally. Thus, EU pays much attention to the influence of its biofuel policy on food security in the world, and on the potentials to reduce GHG emissions from biofuels,[64] with possible effects at different levels. In cases of negative impacts of these issues on other policy areas in EU or in the world, EU emphasizes the necessity to pursue the required coherence.[65] More exact, careful management would be needed, in order to avoid any negative impact on natural resources, caused by the EU policy on sustainable renewable energy and biofuels, such as damaging water, soil and biodiversity.[66] To minimize possible environmental risks, the EU Commission has further promoted the market uptake of new more sustainable types of biofuels, taking as an example biofuels made from waste, forest residues and algae.[67]

When addressing the issue of land use, connected to the production of biofuels, the EU Commission has accentuated the need to consider all land users in a holistic manner, and to integrate land use, land use change and forestry (LULUCF) in the EU policy on sustainable renewable energy and biofuels.[68] The author of the licentiate thesis shares the opinion that it is important to regulate these issues as parts of the same whole, as well as to improve protection of rights to land and land use connected to the production of biofuels. Warnings should be made that it is not easy to control the effects of the biofuel production on land use, land use change, and related GHG emissions. It is probably not enough to rely only on sustainability criteria, when these issues are regulated. Other legal tools and policy measures should be added.

The author of the licentiate thesis presupposes that the EU initiatives within its policy on sustainable biofuels in the transport sector are advantageous for the protection of the global environment. The legal and political powers of EU, directed at preserving environmental interests, exceed what separate EU Member States are able to achieve in this area. EU uses this benefit in a sophisticated manner, being an important environmental actor on the international political arena.[69]

3.2.2 The EU Future Vision

The EU vision on its future environmental development, expressed in the 7th EU Environmental Action Programme (2014), may be seen as progressive and encouraging.[70] Among the

[62] Papers 2 and 4.
[63] Paper 2.
[64] Papers 2, 4 and 5.
[65] Paper 4.
[66] Paper 4.
[67] Paper 2.
[68] Paper 4.
[69] Paper 2.
[70] Paper 4; The EU Commission 7th Environmental Action Programme, EAP (2014), *The new general Union Environment Action Programme to 2020*, January 2014.

formulated global aims, highly relevant for the production of biofuels, there is that people should live well within the limits of our planet. This aim signifies how the humanity should develop. It directs EU at stepping up its efforts to protect our natural capital, at stimulating resource-efficient and low-carbon growth and innovation, and at safeguarding people's health and well-being, while respecting the Earth's natural limits.[71] The aim indirectly restricts the quantity of products that may be made and consumed. It delimits how industries should plan and expand their future activities. Other ideas expressed in the 7th EU Environmental Action Programme, for example that much attention should be paid to turning waste into a resource, with more prevention, reuse and recycling, are of much value for sustainable development, sustainability and environmental protection.[72]

The recently renewed position of EU in its transport sector is that its future should not be built exclusively on biofuels. Much emphasis should be put on improving its efficiency, and on the further development and deployment of electric vehicles, as well as on a comprehensive mix of alternative fuels.[73] All promising options should be included, preserving technological neutrality. Sustainable fuels should be a part of a more holistic and integrated solution.[74] According to the author of the licentiate thesis, it is a well-balanced, reasonable and productive approach. The extended use of biofuels as an alternative fuel in aviation and heavy duty trucks, with strong growth in these sectors after 2030[75] may also be regarded a positive tendency.

In 2014, EU stated one more time that biofuels of an agricultural origin would have a limited role in the decarbonization of the EU transport sector.[76] This is because of the uncertainty, whether any reduction of GHG emissions could be achieved in iLUC cases, caused by the production of biofuels of an agricultural origin, if we compare to the use of traditional fossil fuels. Only advanced biofuels, such as biofuels made from waste, forest residues and algae, should receive public support after 2020.[77]

3.2.3 Directive 2009/28/EC and Directive 2015/1513

Directive 2009/28/EC had functioned as the central legal document of the EU policy on sustainable biofuels in the transport sector up till 2015,[78] when it was amended by Directive 2015/1513. The development process from Directive 2009/28/EC to the amendments in Directive 2015/1513 is remarkable. It emphasizes that the EU environmental concerns about sustainable biofuels and their production are deep-rooted and significant. Directive 2009/28/EC, and the amendments in Directive 2015/1513, as well as related policy documents have been important benchmarks in the EU work towards sustainable biofuels and their production. Emphasizing basically the same main issues, these documents preserve the perspective of long-term sustainability and stability.[79] They underline the importance of elaborating efficient sustainability requirements for the biofuel industry.

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[71] Paper 4.
[72] Paper 4; The EU Commission 7th Environmental Action Programme, EAP (2014), *The new general Union Environment Action Programme to 2020*, January 2014.
[73] Paper 4.
[74] Paper 4.
[75] Paper 4.
[76] Paper 4; Communication from the EU Commission, COM (2014) 15, *A policy framework for climate and energy in the period from 2020 to 2030*.
[77] Paper 4; Communication from the EU Commission, COM (2014) 15, *A policy framework for climate and energy in the period from 2020 to 2030*.
[78] Papers 2, 3, 4 and 5.
[79] Papers 2, 4 and 5.

The amendments in Directive 2015/1513 may be seen as development towards a more comprehensive and consistent legal framework for sustainable biofuels in the EU transport sector.[80] These amendments highlight the importance of balancing the production of food and non-eatable products with environmental protection, biodiversity, and the ecological limits of our planet.[81] There are anticipations that the amendments in Directive 2015/1513 will improve the sustainable quality of biofuels and their production in the EU transport sector.[82]

However, there are certain weaknesses of the amendments in Directive 2015/1513, which can be identified without awaiting the processes of implementation and enforcement.[83] For example, the amendments would only be valid until the end of 2020, which may hamper long term planning and investments. There are also doubts whether the amendments are satisfactory from the perspective of environmental sustainability and protection. It is not clear whether they meet the expectations of the involved actors.[84] What is more, it is uncertain whether the amendments in Directive 2015/1513 result in large-scaled and constructive improvements. The renewed regulations leave many issues up to the EU Member States to decide, in spite of the fact that the EU Member States have different capabilities, approaches and ambitions to sustainable biofuels and their production. This may result in the diverging implementation and enforcement of the amendments at the national level, and a fragmented EU market for biofuels.[85]

The opinion of the author of the licentiate thesis is that the amendments in Directive 2015/1513 are not likely to resolve current environmental challenges in the EU transport sector. Improvements in the production process for biofuels are evidently needed, in order to increase their sustainability, production volumes and quality.[86] Certain amendments in Directive 2015/1513 should be elaborated further, to promote and safeguard sustainable biofuels and their production. The development of the EU transport sector should possibly be more sustainable and purposeful in the future. To achieve this, it may be recommended that the EU regulations on renewable energy, and biofuels in the transport sector should be substantially revised for the period after 2020. More focus should be put on the longer-term approach to decarbonize the EU transport sector, where sustainable biofuels play an important role. More research in this area is required.[87]

3.2.4 Challenges of Advanced Biofuels

The EU development of its policy on sustainable biofuels after Directive 2009/28/EC has started the transition from food-based biofuels of an agricultural origin, which have shown to be environmentally controversial, to more advanced biofuels,[88] such as biofuels made from waste, algae and forest residues.[89] It is supposed that the latter types of biofuels would be more

[80] Paper 5.
[81] Paper 5.
[82] Paper 5.
[83] Paper 5.
[84] Paper 5.
[85] Paper 5.
[86] Paper 5.
[87] Paper 4.
[88] Maciejczak, M. (2016), *Open Innovations as a Key Driver of Bioeconomy Development in Europe*, 15th International Scientific Days, Károly Róbert College, p. 1082.
[89] Papers 4 and 5; Allen, B. et al. (2016), *Sustainability criteria for biofuels made from land and non-land based feedstocks*, p. 3.

sustainable, and would result in more savings of GHG emissions.[90] The author of the licentiate thesis questions the positive sides of this transition. It is not convincing that advanced biofuels would solve the problems, which biofuels of an agricultural origin have not been able to solve.[91] It might be erroneous to rely much on advanced biofuels: future research might show that it is not realistic to supply the EU transport sector with the desirable amounts of these biofuels, because of the limitations in feedstocks for them.[92] In general, it may be impossible to produce as much biofuels, as are needed, to replace traditional fossil fuels.[93]

3.3 The Construction of the EU Legal Framework with Sustainability Criteria

The content of this section is concentrated on the most important issues that are relevant for the use of sustainability criteria in a legal framework.

EU has become one of the first regions in the world, which has introduced a legal framework with sustainability criteria for biofuels.[94] The EU approach has contributed to the development of patterns for the achievement of environmental goals and environmental protection with the help of sustainability criteria. It has been a motivating experience internationally.[95] Directive 2009/28/EC, and subsequently the amendments in Directive 2015/1513 may function as instructive examples of how legal frameworks with sustainability criteria may be built up. The experience of EU contains a lot of useful and efficiently regulated issues, which may be borrowed for industries of a similar kind.[96]

The construction of the EU legal framework with the sustainability criteria may be described as complete, consequent and logical. It provides a convincing impression. It reflects that EU pays much attention to the issues of sustainable development, sustainability and environmental protection. The requirements in Directive 2009/28/EC, and the amendments in Directive 2015/1513 are transparent and clearly formulated. In the opinion of the author of the licentiate thesis, the construction of the EU legal framework for biofuels in the transport sector is efficient and well-functioning.[97] It seems productive that after the major legal framework with the sustainability criteria, i.e. Directive 2009/28/EC, EU has made necessary assessments, scientific research and reconsiderations,[98] and then has worked out amendments, introduced in Directive 2015/1513. The initiative to amend Directive 2009/28/EC, with the purpose to limit the contribution from food-based biofuels of an agricultural origin, and to promote more advanced biofuels, which would not create an additional pressure on food supply and land use,[99] occurs to be reasonable and cautious.

After Directive 2009/28/EC, the EU work in the transport sector has remained advanced, constructive and ambitious. The EU policy on sustainable biofuels, directed at the development

[90] Maciejczak, M. (2016), *Open Innovations as a Key Driver of Bioeconomy Development in Europe*, 15th International Scientific Days, Károly Róbert College, p. 1083.
[91] Papers 2, 4 and 5.
[92] Papers 4 and 5.
[93] Paper 2.
[94] Paper 2.
[95] Paper 2.
[96] Paper 2.
[97] Paper 2.
[98] Paper 4.
[99] Paper 4.

and promotion of more sustainable and advanced biofuels continues.[100] The EU sustainability criteria for biofuels in the transport sector remain an important tool in achieving this goal.

It is interesting and instructive to analyze the construction of Directive 2009/28/EC, and the amendments in Directive 2015/1513. The requirements these legal frameworks set are still under assessment, reconsideration and coordinated improvement. Among the most important elements aimed to support the implementation and enforcement of the sustainability criteria for biofuels, and the function of the Directives, the 10 % renewable energy target, and mechanisms to control the fulfillment of the sustainability criteria may be distinguished.[101] These elements provide a solid basis for the promotion and safeguard of sustainable biofuels and their production. An important fact is that biofuels that do not fulfill the EU sustainability criteria shall not be taken into account, when the final consumption of renewable energy is calculated towards the achievement of the 10 % renewable energy target.[102] This correlation is aimed to provide an incitement for the involved actors to follow the established sustainability criteria. It seems to be a productive and well-functioning approach, which achieves its purpose.

A weakness of the EU legal framework with the sustainability criteria is that there is no definition, or accompanying explanations of how the concepts of sustainable development, sustainability and environmental protection should be interpreted in relation to the production of biofuels in the EU transport sector.[103] There is still much uncertainty in the way sustainability of biofuels and their production methods should be defined and understood. The difficulty here is that a large variety of biofuels are used for different purposes, including electricity, and heating and cooling. Many types of biofuels are still under development or in a testing stage.[104]

From the legal perspective, a harmonized, widely-accepted definitions of biofuels and their most commonly used types may be recommended. Well-formulated definitions, or accompanying explanations would contribute to the clarity and precision of the content of Directive 2009/28/EC, and the amendments in Directive 2015/1513, as well as rationalize the understanding of their implementation area.[105]

3.3.1 The Environmental Target

The research in the licentiate thesis has shown that environmental targets set in a legal framework may interfere with natural market mechanisms.[106] They may also lead to the lack of flexibility with regard to new technologies and new changing conditions.[107] These issues should be taken into account by law-makers.

a) The 10 % Renewable Energy Target

The establishment of the binding 10 % renewable energy target in the EU transport sector has much importance for the development of the biofuel industry. Only biofuels that fulfill the sustainability criteria from Article 17 in Directive 2009/28/EC may be counted for the achievement of the 10 % renewable energy target. The same is about receiving financial

[100] Paper 4.
[101] Papers 2 and 3.
[102] Papers 1, 2 and 3.
[103] Papers 1 and 2.
[104] Paper 1.
[105] Papers 1, 2 and 3.
[106] Paper 2.
[107] Paper 2.

support for the consumption of biofuels: it may only be given for biofuels, which fulfill the EU sustainability criteria.[108] According to the author of the licentiate thesis, this correlation and limitations stimulate the production of sustainable biofuels.[109]

The 10 % renewable energy target facilitates environmental planning, with the purpose to use natural resources for the production of biofuels in the most efficient and rational way.[110] It stirs the development of the biofuel industry, and secures investments. It regulates the quantity of sustainable biofuels that should be produced, imported to and used in EU.[111] The latter aspect is especially important from the environmental perspective: globally, biofuels should be produced in reasonable amounts that are sustainable for our planet, and the carrying capacity of its biosphere. An unreasonable and spontaneous increase in the production of biofuels may lead to the use of less sustainable production methods. Gradual and well-planned increase, on the contrary, is able to facilitate the realization of the biofuel potential.[112] In the opinion of the author of the licentiate thesis, the 10 % renewable energy target would certainly promote the use of sustainable biofuels in EU.[113]

The 10 % renewable energy target for the EU Member States is clearly formulated.[114] It states the level, which national policies in the transport sector shall achieve, and helps to evaluate the efficiency of measures, which the EU Member States apply. The fixed timeframe for the achievement of the renewable energy target would provide stability for the producing industry, and give assurance to necessary investments, which is a very positive impact.[115]

It may be discussed whether there is a need to have binding targets for renewable energy in the EU transport sector, and what strong and weak sides these measures may have.[116] To the mind of the author of the licentiate thesis, EU needs binding targets for renewable energy in the transport sector, where biofuels are estimated to play a dominating role. Biofuels, if produced in a sustainable way, have the potential to contribute to the reduction of GHG emissions and, consequently, to combating climate change.[117] Biofuels are a promising supplement to traditional fossil fuels, which at present are the main source of GHG pollution in EU.[118]

Unfortunately it is uncertain to what extent the EU Member States would succeed in achieving the 10 % renewable energy target by 2020. This uncertainty is arising from the fact that previously set EU renewable energy targets have not been successfully achieved.[119] For example, the achievement of the targets for 2005 and 2010 set in Directive 2003/30/EC has been failed by the majority of the EU Member States.[120] Special efforts to ensure the achievement of the 10 % renewable energy target by 2020 would evidently be needed at the national level.[121] Before the amendments in Directive 2015/1513 came into force, the EU Parliament had highlighted that the 10 % renewable energy target in the EU transport sector

[108] Papers 1, 2 and 3.
[109] Papers 2 and 3.
[110] Paper 2.
[111] Paper 2.
[112] Paper 2.
[113] Paper 2.
[114] Paper 2.
[115] Paper 2.
[116] Paper 2.
[117] Paper 1.
[118] Paper 2.
[119] Papers 2 and 4.
[120] Paper 2.
[121] Paper 4.

would be increasingly difficult to achieve sustainably, if the overall demand for energy in the EU transport sector continued to rise.[122] In this connection, it may be considered whether an interim sub-target for renewable energy in the EU transport sector should have been set,[123] with the purpose to simplify the achievement of the 10 % renewable energy target.

The author of the licentiate thesis suggests that alternative solutions to modify the 10 % renewable energy target should be researched and analyzed. For example, it may be questioned whether the 10 % renewable energy target should be differentiated, reflecting individual conditions of each EU Member State, and what possible effects this may have.[124] The efficiency and usefulness of the EU approach to set new, more demanding renewable energy targets, when the previously set targets have not been achieved may be argued. Knowing that the achievement of the 10 % renewable energy target would depend much on the contribution from developing countries in the form of export of biofuels, or feedstocks for their production, it is doubtful whether EU should impose this obligation on its Member States.[125] The general impression of the author of the licentiate thesis is that the 10 % renewable energy target should not be eliminated. It should be probably minimized, in order to be more realistic.[126]

b) The EU Targets and Visions for Renewable Energy towards 2030 and 2050

The recently revised EU targets for renewable energy towards 2030 and 2050[127] are important, in order to promote sustainable development, sustainability and environmental protection in the EU energy sector and biofuel industry. They facilitate sustainable environmental planning.[128]

The vision expressed by the EU Commission for a 100 % renewable energy system in EU by 2050 is in the eyes of the author of the licentiate thesis very ambitious. It may be more ambitious than what is likely to be achieved in practice.[129] Already the current EU approach to achieve the 10 % renewable energy target in the transport sector calls for much input from the EU Member States. Still, the efforts required for this might not be enough to reach the newly formulated EU renewable energy targets and policy objectives by 2050. The 40 % sub-target for the reduction of GHG emissions by 2030 seems to be more realistic.[130] Subsequent research, and reasonable development of sustainable and efficient post-2020 strategies towards 2050 should be prioritized.[131]

c) The 7 % Cap on Food-based Biofuels

The EU Parliament has pointed out that it would be desirable to reach a significantly higher level of advanced biofuels already by 2020, compared to the current trajectories consumed

[122] Paper 4.
[123] Paper 2.
[124] Paper 2.
[125] Paper 2.
[126] Paper 2.
[127] Paper 4; Communication from the EU Commission, COM (2011) 112 final, *The Roadmap for moving to a competitive low carbon economy in 2050*; The White Paper on Transport, COM (2011) 144, *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*; Communication from the EU Commission, COM (2014) 15, *A policy framework for climate and energy in the period from 2020 to 2030*.
[128] The argumentation in Paper 2 is relevant here.
[129] Paper 4.
[130] Paper 4.
[131] Paper 4.

within EU.[132] In the light of this, each EU Member State should promote consumption of advanced biofuels, and set a non-binding national target for their consumption, which it shall endeavor to achieve.[133] The EU Commission in its turn has proposed to limit the contribution that food-based biofuels, and biofuels from other crops grown on agricultural land could make towards the 10 % renewable energy target in the EU transport sector.[134] This has been done with the purpose to minimize the risks of uncounted GHG emissions linked to iLUC. The partial reduction of the amount of food-based biofuels, which should be used, has the potential to ease for the EU Member States the achievement of the 10 % renewable energy target.

The final compromise on the amendments in Directive 2015/1513 was reached in April 2015.[135] It limited to 7 % the share of food-based biofuels, and biofuels from other crops grown on agricultural land, which could be counted towards the 10 % renewable energy target in the EU transport sector.[136] It may be seen that the amendments in Directive 2015/1513 maintain the obligatory 10 % renewable energy target in the EU transport sector. However, the contribution to this target of food-based biofuels, and biofuels from other crops grown on agricultural land is capped at 7 %. The other 3 % should come from a variety of multiple-counted alternatives, for example biofuels from used cooking oil and animal fats, counted two times.[137]

The author of the licentiate thesis thinks that the introduction of the 7 % cap on the share of food-based biofuels, and biofuels from other crops grown on agricultural land that could be counted towards the 10 % renewable energy target in the EU transport sector has several strong sides. Together with the intention of EU to phase out the use of food-based biofuels of an agricultural origin after 2020, this innovation has the potential to reduce the competition of biofuels with food supply, and to limit possible negative impacts of the production of biofuels on valuable lands, biodiversity and eco-systems.[138]

However, the introduction of the 7 % cap on the contribution of food-based biofuels, and biofuels from other crops grown on agricultural land may be regarded as a means to avoid dealing with cases of iLUC, and their potential negative effects on the environment.[139] The author of the licentiate thesis agrees that it is possible to exclude all types of biofuels with high iLUC estimates from contributing to the 10 % renewable energy target in the EU transport sector. It could go beyond the cap for food-based biofuels, for example restricting the production of oil-based biofuels.[140] A more sound solution may be that EU tries to find approaches and tools for regulating iLUC cases connected to the production of biofuels.[141]

The decision to have the cap at the level of 7 % may be characterized as unnatural and arguable. It is a political compromise that would have impacts on the normal development of the biofuel

[132] Paper 4.
[133] Paper 4.
[134] Paper 4.
[135] Paper 5.
[136] Papers 4 and 5; De Repentigny, P., C. (2016), *The Sustainability of Biofuels: a Principled Lifecycle Assessment of the 2009 European Union Renewable Energy Directive and its Framework*, p. 65; Koponen, K. et al. (2015), *Sustainability of forest energy in Northern Europé*, VTT Technology 237, Finland, p. 57; Palgan, Y., V., McCormick, K. (2016), *Biorefineries in Sweden: Perspectives on the opportunities, challenges and future*, Biofuels, Bioproducts and Biorefining, p. 4; Rana, R. et al. (2016), *Greenhouse gas emissions of an agro-biogas energy system: Estimation under the Renewable Energy Directive*, Science of the Total Environment, 550, p. 1183.
[137] Amended Annex IX, part B in Directive 2015/1513; paper 5.
[138] Paper 5.
[139] Paper 5.
[140] Paper 5.
[141] Paper 5.

industry.[142] There is much uncertainty about the most appropriate size of the cap, which has been gradually increased from 5 % to 7 %,[143] from the point of view of sustainable development, sustainability and environmental protection. It is not clear how the remaining 3 % of renewable energy should be delivered, and what sustainability effects this would have.[144] The attitude of the author of the licentiate thesis is that it is challenging to rely on the sources of renewable energy that are not commercially available in sufficient amounts at present. It may become difficult for the EU Member States to achieve this part of the 10 % renewable energy target. Limitations in scientific knowledge in this area may be observed.[145]

d) The 0.5 % Indicative Sub-target for Advanced Biofuels

As has been highlighted earlier, the amendments in Directive 2015/1513 involve that the EU Member States shall seek to minimize the proportion of food-based biofuels of an agricultural origin, which would be consumed on their territory.[146] To that effect, each EU Member State shall set an indicative national sub-target for advanced biofuels that it shall endeavor to achieve.[147] The reference value for this sub-target is 0.5 % points in energy content, counting from the share of renewable energy in all forms of transport by 2020.[148] Under certain conditions, the EU Member States may set a national target lower than 0.5 % points. The level of the EU Member States' national indicative sub-targets for advanced biofuels shall be established by 6 April 2017.[149] Setting an indicative national sub-target for advanced biofuels seems to be a positive innovation. It contributes to the transition from food-based biofuels of an agricultural origin to more advanced and sustainable biofuels at a reasonable pace.[150]

It may be speculated that setting the 0.5 % indicative sub-target for advanced biofuels may lead to controversial results. Reasons for setting an indicative sub-target, instead of introducing a binding target for the same purpose should be reflected upon.[151] The EU previous experience has showed that the achievement of indicative targets in the area of renewable energy might fail. It is not clear to what extent the EU Member States are motivated to achieve the 0.5 % indicative sub-target, and what consequences for the development of the biofuel industry their achievement would have.[152] The size of the 0.5 % indicative sub-target may also be questioned. The level of 0.5 % in the energy content might not be sufficient enough to promote the deployment of advanced biofuels. Besides, the EU Member States have opportunities to go below 0.5 %, which could weaken the achievement of the 0.5 % indicative sub-target further.[153]

On the other hand, there are many questions and uncertainties about advanced biofuels, including biofuels made from waste, algae and forest residues, promoted with the help of the 0.5 % indicative sub-target.[154] The majority of these biofuels are still going through the

[142] Paper 5.
[143] Paper 4.
[144] Paper 5.
[145] Paper 5.
[146] Paper 4.
[147] Paper 4.
[148] De Repentigny, P., C. (2016), *The Sustainability of Biofuels: a Principled Lifecycle Assessment of the 2009 European Union Renewable Energy Directive and its Framework*, p. 65; Koponen, K. et al. (2015), *Sustainability of forest energy in Northern Europé*, VTT Technology 237, Finland, p. 57.
[149] Paper 5.
[150] Paper 5.
[151] Paper 5.
[152] Paper 5.
[153] Paper 5.
[154] Paper 5.

processes of research and pilot testing. More time would be required for them to be fully developed.[155] Future research might indicate that it is not realistic to supply the EU transport sector with the desirable quantities of advanced biofuels, because of the limitations in their feedstocks.[156] That might be why the EU law-makers should have taken a less ambitious stand on advanced biofuels in the final text of the amendments in Directive 2015/1513.[157]

More detailed research and analysis may be recommended concerning the most appropriate forms and levels of the EU sub-target for advanced biofuels.[158]

3.3.2 Sustainability Criteria

The EU sustainability criteria for biofuels in the transport sector have created substantial obligations for the EU Member States, and other involved countries regarding how biofuels should be produced. The EU sustainability criteria have added to setting an international trend for the biofuel industry.[159] There have been many discussions about the content and choice of the EU sustainability criteria for biofuels by experts and scientists from different fields. Calls have been made to develop sustainability criteria consistent with and relevant for the agricultural sector in general.[160]

In this sub-section it is observed that when sustainability criteria are incorporated in a legal framework, they should be accompanied by special elements aimed to facilitate their implementation and enforcement.[161]

a) The EU Sustainability Criteria in Directive 2009/28/EC

It has been internationally recognized with time that biofuels and their production need to be sustainable.[162] Feedstocks, from which biofuels are made, such as energy crops of an agricultural origin, should fulfill certain sustainability requirements. The EU policy-makers have decided to regulate these issues with the help of sustainability criteria incorporated in a legal framework.[163] A list of sustainability criteria for biofuels has been introduced in Directive 2009/28/EC,[164] aiming to minimize environmental risks that may be caused by the production of biofuels, and to promote sustainable development, sustainability and environmental protection in the EU transport sector. The EU approach has become an important judicial initiative globally.[165]

The EU list of the sustainability criteria may be called one of the internationally strictest for this type of renewable energy.[166] It addresses urgent environmental concerns, and ensures that certain aspects of the biofuel industry would develop in an environmentally sustainable way in

[155] Paper 2.
[156] Papers 4 and 5.
[157] Paper 5.
[158] Paper 5.
[159] Paper 3.
[160] Paper 3.
[161] Papers 2 and 3.
[162] Papers 2 and 3.
[163] Paper 3.
[164] Papers 1, 2 and 3.
[165] Papers 2 and 3.
[166] Paper 3.

the foreseeable future.[167] The EU list should evidently be regarded a minimum list of sustainability criteria, which functions to ensure rational GHG emission savings, and to avoid major environmental impacts on the use of land and biodiversity.[168] The EU list of the sustainability criteria contributes to gaining experience of how to promote and safeguard sustainable products and their production with the help of sustainability criteria incorporated in a legal framework. It creates a link between the concepts of sustainable development, sustainability and environmental protection, and their practical implementation and enforcement in a particular industry.[169]

The content of the EU sustainability criteria for biofuels is transparent and clearly formulated.[170] They are not dubious or elusive. The strict minimum threshold for GHG emission savings and the land-use requirements, which the sustainability criteria set, are grounded in detailed and encompassing scientific data.[171] The sustainability criteria are the same for all the EU Member States, which implies that a Member State does not have the right to establish stricter sustainability criteria for biofuels.[172] The sustainability criteria must be fulfilled cumulatively. They are similarly applied to biofuels produced in EU, and biofuels imported from other countries in the world.[173] The latter aspect emphasizes that it is important to ensure that the process of making biofuels is sustainable both inside and outside EU. An on-going communication with countries outside EU should be upheld. A question to reflect upon is what type of a producer is able to manufacture environmentally sustainable biofuels.[174]

The EU approach to combine the quantity of biofuels, which has the form of the binding targets for renewable energy, and their sustainable quality, expressed as the list of the sustainability criteria, gives an impression of being efficient and sustainable from the environmental perspective.[175] It has much influence on the international production of biofuels. It may motivate the involved actors to develop voluntary sustainability standards, and additional sustainability criteria, with the purpose to verify their production of biofuels according to the EU requirements.[176] For example, non-governmental organizations (NGOs) might have interest to complete the sustainability criteria in the EU legal framework with additional voluntary criteria, and create a very solid voluntary sustainability standard for biofuels.[177] Large companies might have interest to develop voluntary sustainability standards to meet the market demands created by the EU policy on sustainable biofuels in the transport sector.[178]

There is a number of weak sides of the EU approach to use the sustainability criteria for biofuels in the transport sector that should be thoroughly considered.[179] Thus, the EU list of the sustainability criteria presented in Directive 2009/28/EC is one-sided and very limited. The sustainability criteria have not been set for other issues than environmental protection.[180] Even from the environmental perspective, the EU list and issues that it regulates are not enough to

[167] Paper 3.
[168] Paper 3.
[169] Paper 3.
[170] Paper 2.
[171] Paper 3.
[172] Papers 2 and 3.
[173] Papers 2 and 3.
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[175] Paper 2.
[176] Paper 3.
[177] Paper 2.
[178] Paper 2.
[179] Paper 3.
[180] Papers 2 and 3.

promote and safeguard sustainable biofuels and their production. Such important environmental issues as air, soil and water protection during the production of biofuels are left outside the scope of the EU sustainability criteria.[181] Directive 2009/28/EC, and subsequently the amendments in Directive 2015/1513 request only research and assessment of these issues. This problem needs to be addressed in the near future. Otherwise unsustainable and unplanned production of biofuels may cause air pollution,[182] as well as soil and water degradation.[183]

Another weak side of the EU approach may be seen in the fact that EU has chosen not to regulate special agricultural issues regarding sustainable biofuels and their production with the help of the sustainability criteria. Instead references have been made to the obligatory regulations of the EU agricultural practices under the EU Common Agricultural Policy, and other relevant environmental regulations, which may be applicable on biofuels of an agricultural origin.[184] Though the EU Commission has stressed that when pressure on agricultural resources increases, it is important to ensure that protection measures remain adequate,[185] it may be argued that this solution is not enough to guarantee and safeguard sustainable biofuels of an agricultural origin and their production.

Many other important issues have been left outside the EU list of the sustainability criteria, for example avoiding competition with the market of food supply, and the issue of genetically modified organisms cultivated for the production of biofuels. The lack of regulations of the latter issue may result in irreversible environmental damage. Additional cautions concerning the use of genetically modified organisms should be taken, because there is not much scientifically proved knowledge about their potential effects on the environment.[186]

One more weak side is that voluminously formulated sustainability criteria, as in the EU approach, do not reflect regional special traits and features, such as variations in climate, soil quality, infrastructure and economic development. These factors may cause differences in production processes that may lead to difficulties in the implementation and enforcement of the sustainability criteria, and in the assessment of their fulfillment.[187] On the contrary, if the EU legal framework with the sustainability criteria is very much detailed, there is the risk that it becomes out of date quickly, and, as a consequence, contra-productive to its environmental goal. Besides, an often changing legal framework is not able to create stability and certainty in the area it regulates.[188] It may be explained that EU has chosen not to make a more detailed list of the sustainability criteria, because it is difficult to justify trade-distorting measures of this kind to the WTO. As a result, EU has just included many important sustainability issues, relevant for biofuels and their production, in the reporting and monitoring requirements of its Member States.[189] The task for the future is to research and analyze what kind of sustainability criteria in a legal framework would hold ground in case of a conflict with the WTO regulations.

With the introduction of the EU list of the sustainability criteria, a number of challenging questions become urgent that are not easy to answer. Does EU have any ethical right to impose its sustainability concerns on other countries in the world? How would the involved actors,

[181] Papers 3 and 4.
[182] Papers 2 and 3.
[183] Allen, B. et al. (2016), *Sustainability criteria for biofuels made from land and non-land based feedstocks*, p. 18.
[184] Papers 2 and 4.
[185] Paper 4.
[186] Paper 1.
[187] Paper 3.
[188] Paper 3.
[189] Paper 3.

including producers of biofuels in developing countries, react to the EU initiatives? At what scale have their opinions been taken into account, when the EU sustainability criteria for biofuels in the transport sector have been formulated?[190]

It may be speculated that EU has not framed its policy on sustainable biofuels in the light of possible developmental trends and impacts on other regions and countries that may be involved in the production of biofuels, for example countries in Africa, although the EU 2020 renewable energy targets are not likely to be achieved without their contribution.[191] It may happen that developing countries lack technological and other solutions, including legal frameworks, social conditions and infrastructure, required for the sustainable production and export of biofuels, according to the EU list of the sustainability criteria. There are risks that a large-scaled production of biofuels in developing countries may deteriorate ecological systems despite the EU sustainability criteria.[192] What is more, it has not come out from the EU policy documents to what extent costs for the fulfillment of the EU sustainability criteria and proving compliance with them, which is the responsibility of the involved producers, have been taken into account by the EU policy-makers.[193] It should be discussed, whether binding regulations on the production of sustainable and cost-effective biofuels inside EU should be developed.[194] However, it may take a considerable effort and time to work out sustainability criteria that regulate these issues.

Warnings have been made that biofuels may be imported into EU, even if they do not follow the legislated sustainability criteria. Compliance with them is only required, when biofuels are to be counted towards the achievement of the EU or national renewable energy obligations, or to be eligible for financial support.[195] Measures against the establishment of a parallel market of unsustainable biofuels in EU should possibly be taken. Otherwise biofuels that fulfill the EU sustainability criteria may comprise a small higher price segment, while the uncertified biofuels would probably supply the rest of the market. This implies that the legislated sustainability criteria of EU are not able to fully resolve the issue of sustainable biofuels and their production.[196]

There have been many uncertainties around the future development of the EU list of the sustainability criteria.[197] Effects of an increased production of biofuels on GHG emissions and land-use change (LUC) at the global level have been analyzed in some studies. The achieved research results suggest that in addition to biofuel-specific sustainability criteria, strict land-use policies should be used to reduce GHG emissions, and the loss of biodiversity and habitats.[198]

In the opinion of the author of the licentiate thesis, the elaboration of the EU list of the sustainability criteria for biofuels should be continued, in order to promote their sustainable quality, and establish a minimum level of environmental protection during their production.[199] Sustainability criteria that regulate rational use of water,[200] and tolerable use of chemical

[190] Paper 2.
[191] Paper 3.
[192] Paper 2.
[193] Paper 3.
[194] Paper 2.
[195] Papers 1, 2 and 3.
[196] Papers 2 and 3.
[197] Paper 3.
[198] Paper 3.
[199] Paper 2.
[200] Papers 1 and 5.

fertilizes and pesticides should be included.[201] Enclosure of more specific issues of environmental protection that may be added to the EU list of the sustainability criteria for biofuels needs to be discussed. In this connection such specific issues may be named as impacts on soil and soil fertility, effects on water quality and water supply, and the reduction of the emissions that cause acidification, eutrophication and ozone destruction.[202] It should be observed that different types of biofuels would need different sustainability criteria, depending on their production material, and the chosen production method.[203]

b) Lack of Regulations of the iLUC Issue

Among the urgent environmental challenges, which have not been addressed by the EU list of the sustainability criteria, there is the issue of indirect land use change (iLUC)[204] caused by the production of biofuels. It may be considered a significant weakness of the EU approach, because iLUC cases may have a decisive impact on the environmental sustainability and viability of biofuels.[205] It has been explained in EU that where grassland, or agricultural land previously destined for food and feed markets are diverted to the production of biofuels, the non-fuel demand should be satisfied either through the intensification of the current production, or by bringing non-agricultural land into production elsewhere.[206] The latter case constitutes iLUC. When the conversion of land with high carbon stock is involved, it could lead to unexpected GHG emissions.[207]

It has been highlighted that GHG emissions originated from iLUC could negate some or all of the GHG emission savings for different types of biofuels.[208] Bearing in mind that current biofuels are mainly produced from crops grown on agricultural land, iLUC cases have the potential to reduce the contribution of biofuels to the achievement of the 10 % renewable energy target. In addition, iLUC cases may have long-lasting negative effects on soil, water and air quality, as well as on biodiversity.[209]

The research in the licentiate thesis has underlined that it is actually a problem that the issue of iLUC is not included in the EU list of the sustainability criteria. Farming of energy crops for biofuels may displace the current production of agricultural food and feed, as well as the production of forest-related goods, such as fiber and timber, to other areas. It would lead to negative iLUC impacts.[210] There is a risk that the displacement caused by iLUC would move previous agricultural production to areas outside of a country, making it very complicated to estimate possible consequences.[211] ILUC cases may cause profound disagreements between the EU Member States.[212]

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[201] Papers 2, 3 and 5.
[202] Papers 2 and 3.
[203] Papers 1, 2 and 3.
[204] De Repentigny, P., C. (2016), *The Sustainability of Biofuels: a Principled Lifecycle Assessment of the 2009 European Union Renewable Energy Directive and its Framework*, p. 12.
[205] Paper 3; Allen, B. et al. (2016), *Sustainability criteria for biofuels made from land and non-land based feedstocks*, p. 2, p. 17, p. 26; de Repentigny, P., C. (2016), *The Sustainability of Biofuels: a Principled Lifecycle Assessment of the 2009 European Union Renewable Energy Directive and its Framework*, p. 135.
[206] Papers 4 and 5.
[207] Paper 4.
[208] Paper 4.
[209] Paper 3.
[210] Paper 3.
[211] Paper 3.
[212] Paper 5.

c) Amendments in Directive 2015/1513

The EU list of the sustainability criteria has got no significant development in the amendments in Directive 2015/1513. During the preparations to amend Directive 2009/28/EC, many problems connected to iLUC have been discussed, but they have not resulted in new sustainability criteria that would regulate this issue. It may be speculated that EU has prioritized climate change mitigations above other sustainability concerns, as for example protection of soil, water and biodiversity, which may be characterized as a limited perspective.[213]

Having chosen not to regulate iLUC in the amendments in Directive 2015/1513, EU has not focused on how the involved actors could reduce iLUC and its possible negative effects, related to the production of biofuels.[214] Promising measures and practices of land use, such as improved land use planning, development of monitoring, biodiversity protection programs, agro-economic zoning, and utilization of degraded lands have been left aside. Opportunities to use non-arable land, and waste water or sea water for irrigation have not been taken into account. Instead, EU has reduced the role of food-based biofuels, and biofuels from other crops grown on agricultural land, with the purpose to avoid iLUC cases.[215] Potential benefits of this approach may be questioned.

In the opinion of the author of the licentiate thesis, the amendments in Directive 2015/1513 are not as far-reaching and demanding as they should be. They do not sufficiently address the potential negative consequences of the production of biofuels. They do not incentivize the production and use of biofuels with better GHG performance.[216] The amendments in Directive 2015/1513 would probably not discourage oil companies from supporting and investing in traditional fossil fuels. The amendments in Directive 2015/1513 are not likely to resolve the numerous challenges of sustainable biofuels and their production in the EU transport sector.[217]

The precautionary principle, which is an established practice in environmental law, presupposes careful attitude to the production of advanced biofuels, until a clearer understanding of their environmental impacts, based on scientific knowledge, emerges.[218] At present, features of sustainability, efficiency and performing potential of more advanced biofuels remain unclear. Conversely, radical changes in the EU approach to renewable energy and biofuels may lead to weak implementation and enforcement, and the failure of the EU Member States to achieve the EU renewable energy targets.[219] Further elaborations and improvements in this area are needed.[220]

3.3.3 Control Mechanisms

Mechanisms to control the fulfillment of the EU sustainability criteria are increasingly elaborated in the EU approach to sustainable biofuels in the transport sector.[221] They represent a coherent system of control, based on reporting obligations and transparency to the public.[222]

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[217] Paper 5.
[218] Paper 1.
[219] Paper 5.
[220] Paper 1.
[221] Paper 3.
[222] Papers 2 and 3.

It is stressed in Point 11 of the Preamble in Directive 2009/28/EC that it is necessary to set transparent and unambiguous rules for calculating the share of renewable energy.[223] It is stated further in Point 78 of the Preamble that it is appropriate to monitor impacts of the biofuel cultivation, such as through land use changes, including displacement, the introduction of invasive alien species and other effects on biodiversity, and effects on food production and local prosperity.[224] The opinion of the author of the licentiate thesis is that it is positive and advantageous that the EU approach to use the sustainability criteria takes into consideration these sustainability concerns.

Articles 18 and 19 in Directive 2009/28/EC contain explicit rules about how the fulfillment of the sustainability criteria for biofuels is to be controlled.[225] The EU control mechanisms require the EU Commission and the EU Member States to report on measures taken to respect the sustainability criteria for biofuels, and their impact on additional sustainability issues, such as an increased pressure on food security, developmental tendencies in countries outside EU, respect of land-use rights, and protection of air, soil, water and biodiversity.[226] These control mechanisms make the EU policy responsive to issues that need further development. They create a solid platform for the reconsideration of the achieved results and an ongoing assessment.[227]

Important requirements to provide information to the involved actors, and to keep certain information transparent to the public may be found in Articles 14, 21 and 24 in Directive 2009/28/EC.[228] Particularly, the EU Member States shall ensure that information is given to the public on the availability and environmental benefits of all different renewable sources of energy for transport.[229] To the mind of the author of the licentiate thesis, these rules and constant open communication with the involved actors contribute to the efficient implementation and enforcement of the EU sustainability criteria for biofuels in the transport sector.

After Directive 2009/28/EC coming into force, it has been noted in EU that voluntary sustainability standards play an increasingly important role in providing evidence of compliance with the EU sustainability criteria for biofuels.[230] Due to this, their function, and the requirements they set should be controlled more. It would be appropriate to mandate the EU Commission to require voluntary sustainability standards to report regularly on their activities.[231] The reports should be made public, in order to increase transparency, and to improve oversight by the EU Commission. This approach would additionally help to identify best sustainability practices in the biofuel industry.[232]

[223] Paper 2.
[224] Paper 2.
[225] Paper 3.
[226] Paper 3; De Repentigny, P., C. (2016), *The Sustainability of Biofuels: a Principled Lifecycle Assessment of the 2009 European Union Renewable Energy Directive and its Framework*, p. 69.
[227] Paper 3.
[228] Paper 2.
[229] Paper 2.
[230] Paper 4.
[231] Papers 4 and 5.
[232] Paper 4.

The extended control mechanisms and reporting obligations at both the EU and national levels is a positive development in the amendments in Directive 2015/1513.[233] More specifically, the reporting and publishing of data on iLUC-related GHG emissions at both the EU and national levels have been introduced in amended Articles 23.4, 23.5, 23.8, and Article 22.1 in Directive 2015/1513. Estimated GHG emissions connected to iLUC cases would be made transparent with the help of the established reporting requirements.[234] To add to this, the EU Member States shall ensure that when fraud is detected, appropriate actions are taken.[235]

Some weak sides of the EU approach to control the fulfillment of the EU sustainability criteria may be found, which need to be researched further and improved. Particularly, the scope of the EU sustainability criteria, and especially the calculation methodology for GHG emissions, may be complicated for an ordinary producer. It may be difficult to apply them.[236] The current calculation methodology for GHG emissions presented in Article 19 of Directive 2009/28/EC is too narrow, which may be considered as a weakness of the EU system of control. For example, the actual utilization of industrial residues is not included there.[237] The related guidelines of the EU Commission need possibly to be revised to make sure no misleading incentives are given for controlling the fulfillment of the first sustainability criterion.[238]

For the three EU sustainability criteria for land use, indicators, and measuring and evaluation mechanisms are not thoroughly developed. For some issues of land use there are scientific data gaps.[239] It should be noted that large-scaled environmental issues, like additional pressure on pristine land, cannot be appropriately assessed on a company or farm basis.[240] Besides, it is arguable to what extent biofuel producers and land owners, as well as countries outside EU are interested in maintaining and safeguarding the EU mechanisms to control the fulfillment of the EU sustainability criteria. A partial solution may be to assign certain conversion values to different countries.[241]

The EU Parliament has highlighted that there is much inconsistency regarding the factors that may have effects on the sustainability of biofuels and their production.[242] Among them there are different data inputs and key assumptions on the development of the biofuel industry. Different trends in agricultural yields and productivity, co-product allocation and deforestation rates may be added.[243] When dealing with iLUC cases, it may be difficult to control them within the frames of a legal framework, because the sustainability issues they involve could lie beyond what is practically and technically possible to control for an ordinary biofuel producer.[244]

It may be concluded that the work, aimed at the elaboration and improvement of the mechanisms to control the fulfillment of the EU sustainability criteria continues. In the amendments in Directive 2015/1513, the EU system of control has been expanded.[245] To the

[233] Paper 5.
[234] Papers 4 and 5.
[235] Paper 5.
[236] Paper 3.
[237] Paper 3.
[238] Paper 3.
[239] Paper 3.
[240] Paper 1.
[241] Paper 1.
[242] Paper 4.
[243] Paper 4.
[244] Paper 5.
[245] Paper 5.

mind of the author of the licentiate thesis, public participation and public awareness about sustainable biofuels and their production should be increased in the future, in order to make the EU policy on sustainable biofuels in the transport sector more efficient in relation to its purpose. Relevant information about different types of biofuels, and their influence on environment should be distributed to consumers, so that they comprehend their preferences and choices better.[246] The development and use of systems, which would track and trace feedstocks, and the resulting biofuels during the whole chain of making this product should be encouraged.[247]

It is uncertain to what extent the renewed EU system of control is satisfactory, because it remains difficult to get a detailed insight in what happens outside EU.[248] The EU approach to control the fulfillment of the sustainability criteria should obviously be elaborated and improved further, taking into consideration what different groups of biofuel producers are able and capable of achieving.[249]

[246] Paper 2.
[247] Paper 5.
[248] Paper 5.
[249] Papers 2 and 3.

4. SUMMARIZING REFLECTIONS

Much experience may be gained from the EU approach to use the sustainability criteria for biofuels in a legal framework.

The preparation to make up a list of sustainability criteria for a particular product or industry may be started with the question what issues are relevant and important for the sustainability criteria to function appropriately in a legal framework. Without taking these issues into account, it may be difficult for a legal framework with sustainability criteria to be efficient in relation to its purpose.[250] One of the main issues, to the mind of the author of the licentiate thesis, concerns the interpretation of the concepts sustainable development, sustainability and environmental protection in the industry that sustainability criteria are made for.[251] A strong emphasis on these concepts that interconnect should be in the center of any economic, environmental and social activity.[252]

Another important issue is that it may be within the competence of technical experts to work out a list of sustainability criteria necessary for the chosen product or industry.[253] The task of law-makers should be to formulate the suggested sustainability criteria in a precise and transparent way, so that they may be implemented and enforced without difficulties. The use of sustainability criteria in a legal framework may be made more efficient, if they are connected to a binding environmental goal, like it has been done in the case of the EU sustainability criteria for biofuels.[254] Indicators should be elaborated for the assessment and reconsideration of how sustainability criteria are fulfilled.[255]

Certain aspects of the EU approach to use the sustainability criteria for biofuels may be borrowed by other industries and countries that wish to develop a legal framework for sustainable products and their production.[256] For example, it is important that together with the improvement of technological possibilities, the development of legal frameworks that support sustainable products and their production takes place. The elaboration of a combination of legal frameworks, governing policies, and implementation and enforcement tools, which have the same environmental goal should be considered. The task of law in this case may be to contribute to the sustainability of a product and its production through the use of traditional and newly emerging legal approaches and tools, such as sustainability criteria incorporated in a legal framework.[257] However, an industry may suffer from trying to fulfill too many sustainability requirements. In such situations, there is a need to evaluate and compare implementation and enforcement results of sustainability criteria for a particular product or industry in different legal frameworks.[258]

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[250] Pavlovskaia, E. (2013), *Using sustainability criteria in law*, International Journal of Environmental Protection and Policy, vol. 1, issue 4, pp. 76 – 77.
[251] Pavlovskaia, E. (2013), *Are We There Yet? A Legal Assessment and Review of the Concept of Sustainable Development under International Law*, Journal of Sustainable Development Law and Policy, Afe Babalola University, vol. 2, issue 1, pp. 139 – 152.
[252] Paper 1.
[253] Paper 3.
[254] Papers 2 and 3.
[255] Paper 3.
[256] Paper 2.
[257] Paper 1.
[258] Paper 1.

In the case of biofuels, the task of law may be to create well-functioning legal frameworks that will preserve the environment, and facilitate economic and social growth connected to the production and use of biofuels.[259] The main purpose of a legal framework for biofuels may be formulated as sustainable development, sustainability and environmental protection in the biofuel industry, which includes sustainable production, transportation and use of biofuels. Preservation and improvement of various ecological qualities like air, soil and water may under such conditions be natural environmental sub-goals.[260]

Sustainability requirements for biofuels will differ depending on the purposes of the biofuel production. Thus, sustainability issues for small-scaled biofuel production for local purposes will differ from sustainability issues for biofuels that are produced as a global contribution to traditional fossil fuels. Large-scaled production of biofuels should be carefully planned.[261] Collaboration between various groups of the involved actors, including research institutions, has the potential to improve considerably the quality, enforcement and implementation of sustainability criteria.[262]

Possibilities to establish a homogeneous international regime for sustainable biofuels and their production should be thoroughly discussed. Creation of an international regime of this kind, where the issues most relevant and important for the global sustainability, and the carrying capacity of the Earth's biosphere and ecosystems are taken into consideration, could be a desirable solution.[263] The formation of an international regime for sustainable biofuels would involve compulsory and voluntary initiatives with various degrees of public and private participation at different levels. Among them, the promotion and implementation of governing measures, the cooperation and input of NGOs, the development of small and large-scaled biofuel producing companies, and the contribution of regional representatives may be mentioned.[264]

The main weak side of this approach is that it is very difficult practically to create an international environmental regime. It is problematic to influence countries with different, and sometimes contradictory interests to join it. Even if a desirable number of countries-participants is found, the creation and subsequent development of this regime would be a slow process that may take years of negotiations.[265] If such a regime comes into being, there would be a need for a supra-national institution to govern and implement its legal frameworks and policies. It may be difficult to establish this type of an institution and to organize its efficient work.[266]

Due to these reasons, the EU initiatives and efforts within its approach to sustainable biofuels do not seem to be enough to create and govern an international environmental regime for this product.[267] On the other hand, the 10 % renewable energy target in Directive 2009/28/EC, and the preliminary EU targets for renewable energy towards 2030 and 2050 are likely to stimulate the creation of the internal EU regime for sustainable biofuels, with strong impacts on the international biofuel production.[268]

[259] Paper 1.
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[261] Paper 1.
[262] Paper 1.
[263] Paper 2.
[264] Paper 2.
[265] Paper 2.
[266] Paper 2.
[267] Paper 2.
[268] Paper 2.

EU appears to have the potential to push forward and guide the regional work at sustainable development and sustainability in the biofuel industry.[269] This could be done with a special focus on the issues of harmonization between the existing legal frameworks and voluntary sustainability standards for biofuels, in order to avoid overlapping regulations and double work, which may lead to counterproductive results. Much emphasis may be put on the achievement of equal conditions for producers, suppliers, distributors and other involved actors, so that they follow approximately the same sustainability criteria. EU may also strive to minimize the number of actors, who do not recognize, or wish to fulfill sustainability criteria for biofuels.[270] An interesting question is to what extent it is possible to address the issue of GHG emissions from deforestation and biodiversity loss at a more global level, and to minimize their negative effects. The role of developing countries and other involved actors should not be underestimated in this process. [271]

Assessment and reconsideration mechanisms should possibly be included in a legal framework with sustainability criteria. One of their roles is to ensure that a legal framework functions as it has been aimed for. Critical questions that may be raised with the purpose to safeguard and preserve sustainable development, sustainability and environmental protection are whether a legal framework with sustainability criteria functions as it has been planned, and whether it leads to the achievement of the set environmental goals. Assessment and reconsideration regarding how a legal framework with sustainability criteria prevents environmental damage and degradation are important.[272] In general, there is a need to analyze, assess and reconsider the implementation and enforcement results for sustainability criteria, as well as to make this information transparent to the public and other involved actors. There is also a need for further research in this area.[273]

Judging from the EU experience to use the sustainability criteria for biofuels, it may be summarized that a legal framework with sustainability criteria should not necessarily be a goal in itself. It may be a part of a package of policy measures and tools used to promote and safeguard sustainable development, sustainability and environmental protection.[274] In some cases, difficulties may occur in controlling the fulfillment of legislated sustainability criteria. Theoretically well-constructed control mechanisms may fail to fulfill their purpose, if it is not practically possible to control each stage of making a product.[275] The author of the licentiate thesis suggests that limitations of what is sustainable and practically possible to control should be considered and respected.

[269] Paper 3.
[270] Paper 3.
[271] Paper 3.
[272] See the reflections in Paper 2.
[273] Paper 1.
[274] Paper 2.
[275] Paper 3.

5. CONCLUSIONS

The research and analysis conducted in the licentiate thesis have shown that sustainability criteria incorporated in a legal framework may function efficiently as a legal tool, addressing environmental problems and challenges, and minimizing environmental risks. The conclusion may be drawn that sustainability criteria have the potential to become a significant legal tool, which contributes to the promotion and safeguard of sustainable products and their production.

Sustainability criteria should however not be seen as the only solution for dealing with environmental problems and challenges.[276] There is a variety of other legal means and governance approaches that may be used with similar purposes, such as eco-labels and eco-design of products. Sustainability criteria may be used in combination with them or alone. If sustainability criteria are incorporated in a legal framework, their content should be clearly formulated. The scope of their function should be explicitly delimited and explained. It should be transparent to different groups of the involved actors, what purpose sustainability criteria are aimed to have. The use of sustainability criteria should not increase risks of damaging the environment.

Though the EU approach to use the sustainability criteria for biofuels is still under development and improvement, it is an instructive example of how sustainability criteria may be used in law, and how they may contribute to the achievement of environmental goals. Certain aspects of the EU approach may be borrowed by other industries, as well as by other countries that wish to develop legal frameworks with sustainability criteria.

The opinion of the author of the licentiate thesis is that the sustainable future of the biofuel industry in EU should be carefully planned and protected. New and more efficient approaches to use biofuels, and other sources of renewable energy in the EU transport sector should be elaborated, in order to create genuine benefits for people and our planet. Since hopes for the future of the EU transport sector are now concentrated around the use of advanced biofuels, an important initiative may be to develop sustainability criteria for these types of biofuels and their production. It should be discussed whether sustainability requirements for the constantly growing EU transport sector should be set.

Search for more appropriate and efficient solutions to use sustainability criteria in legal frameworks should be continued. In performing this task, thoroughly organized international cooperation is desirable, with the purpose to improve coherence in the development of harmonized sustainability criteria for a particular product and its production. Setting up strategies of good practice, and integrating sustainability criteria in international trading mechanisms may be recommended to ensure this.

[276] This conclusion is emphasized by the opinion expressed in Palgan, Y., V., McCormick, K. (2016), *Biorefineries in Sweden: Perspectives on the opportunities, challenges and future*, Biofuels, Bioproducts and Biorefining, p. 6.

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ATTACHED PAPERS

As has been written in chapter 2, the licentiate thesis is based on following five papers:

1. Pavlovskaia, E. (2013), *Sustainability of transport biofuels from a legal perspective*, International Journal of Environmental Protection and Policy, vol. 1, issue 4, 2013, pp. 88 – 93.

2. Pavlovskaia, E. (2014), *Legal Analysis of the EU Policy for Sustainable Transport Biofuels*, Environment and Ecology Research, vol. 2, issue 2, 2014, pp. 60 – 75**.**

3. Pavlovskaia, E. (2014), *Legal Analysis of the European Union Sustainability Criteria for Biofuels*, Journal of Sustainable Development Law and Policy, vol. 3, issue 1, 2014, pp. 4 – 21.

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5. Pavlovskaia, E. (2015), *Analysis of the Main Innovations in Directive 2015/1513 on Renewable Energy*, Renewable Energy Law and Policy Review (RELP), vol. 6, issue 4, 2015, pp. 294 – 300.

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Sustainability of transport biofuels from a legal perspective

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Abstract: The article investigates the notion of transport biofuels, their possible advantages and disadvantages in comparison to traditional fossil fuels, and sustainability requirements that need be stated to their quality and production methods from a legal perspective. The research results indicate that the understanding of what makes the quality and production of transport biofuels sustainable is still unclear. Sustainability parameters for biofuels will differ depending on the types and purposes of biofuel production. There is no clearly agreed definition on what biofuels, and particularly sustainable biofuels are. The task of law in this situation can be to contribute to the sustainable production of biofuels through the use of the traditional and newly emerging legal approaches and instruments, such as e.g. sustainability criteria for biofuels in Directive 2009/28/EC.

Keywords: Transport Biofuels, Sustainable Biofuels, Use of Genetically Modified Organisms, EU Biofuel Policy

1. Introduction

In 2009, two EU Directives 2009/28/EC [1] and 2009/30/EC [2] came into force [3]. They constituted a legal framework for the production and use of sustainable biofuels in EU, particularly in the transport sector. The EU Directives contains sustainability requirements to biofuels in the form of binding sustainability criteria. The fulfillment of these criteria is a necessary requirement for biofuels to count towards the EU mandatory 2020 renewable energy targets and to get governmental subsidies [4].

To enforce and implement the EU Directives 2009/28/EC and 2009/30/EC in an efficient way, it has become important and urgent to get a clearer picture of what transport biofuels as a product are and what makes their production sustainable. The *objective* of this article is, thus, to research and generate a deeper understanding about (a) the notion of transport biofuels; (b) their possible advantages and disadvantages in comparison to traditional fossil fuels; and (c) requirements that need be stated to the quality of biofuels and their production, in order to promote and safeguard their sustainability. The research is done from the perspective of the current EU legislation on sustainable transport biofuels. The rapid development of technology, policies and law in this area, which causes changing preconditions and circumstances, is taken into account.

2. What are Transport Biofuels

The market of biofuels is a relatively new market that is characterized by speedy development and use of new technologies, which in many cases have governmental support, for example in the form of subsidies and favorable taxation. The increase in the biofuel production and use is observed in a lot of countries in different parts of the world, such as in US, Canada, Brazil, EU, China, Japan, Ukraine, Indonesia, etc.

Biofuels are a source of renewable energy. There are some differences in the way this concept is defined by scientists, and there is no internationally agreed definition. [5] In a simple way, biofuels can be defined as solid, liquid or gaseous fuels derived from organic or recently dead material (not more than 20 – 30 years old), such as plants, animals or their by-products. Examples of liquid biofuels are bioethanol, biodiesel, biobutanol and biomethanol. Examples of gaseous biofuels are biogas and biohydrogen. Liquid biofuels can be used either purely, for example 100 % bioethanol and 100 % biodiesel, or in various mixtures, such as 10 % bioethanol and 90 % the traditional gasoline; or 2 % biodiesel and 98 % the traditional diesel.

Biofuels are distinguished from traditional fossil fuels, which are produced from long dead biological material. Theoretically, biofuels can be produced from any biological

carbon source, including manufactural or municipal waste and residues of biological origin from agriculture, forest and related industries. Most commonly, biofuels are made by extracting oil from oleaginous plants, for example sunflowers, or by fermentation of the sugars in cereals such as wheat and maize. Wood and its by-products can also be converted into biofuels. At present, biofuels in the transport sector are mainly used as fuels for road motor vehicles.

There are two well-established strategies of producing liquid biofuels, which are particularly interesting for the transport sector. One is to grow crops high in sugar, such as sugar cane, sugar beet and sweet sorghum, or in starch, such as corn and maize, and then use yeast fermentation to produce ethanol. The second strategy is to grow plants that contain high amounts of vegetable oil, such as oil palm, soybean, algae, jatropha or pongamia pinnata. When these oils are heated, their viscosity is reduced, and they can be burned directly in a diesel engine, or they can be chemically processed to produce fuels such as biodiesel. Wood and its by-products can be converted into biofuels such as woodgas, methanol or ethanol fuel. It is also possible to make cellulosic ethanol from non-edible plant parts, but this can be difficult to accomplish economically.

Most often used forms of biofuels are bioethanol, biodiesel and biogas. Bioethanol is a biofuel substitute for petrol. [6] It is manufactured from cereal based crops, mainly wheat in the UK; sugar beet and maize, soyabeans and sugarcane in US and the South America. Biodiesel is a biofuel substitute for diesel. It is produced from oilseed based crops – mainly oilseed rape in the UK, and palmoil in the South East Asia. [7] Bioethanol and biodiesel are classified as the first generation biofuels, or biofuels of an agricultural origin. They are derived from raw materials that can be used in food production.

Biogas is a biofuel substitute for natural gas. [8] It can be produced from organic waste materials including animal waste and waste generated from municipal, commercial and industrial sources through the process of anaerobic digestion. Biogas manufactured from waste belongs to the second generation biofuels. This generation consists of biofuels from non-food crops including cellulosic biofuels, and special-energy-or-biomass crops as for example Miscanthus.

Many types of biofuels are under development, such as biohydrogen, biomethanol, DMF, Bio-DME, and Fischer-Tropsch diesel. Genetically modified organisms (GMOs) as substance for biofuel production is another emerging field, which effects on environment should be researched.

Production of transport biofuels can be divided in two main stages: (a) farming of crops for biofuels of an agricultural origin, or using other materials and technologies to prepare the substance for manufacturing of biofuels; and (b) manufacturing of transport biofuels from the prepared substance. Both these stages should be sustainable, [9] though they require different approaches and criteria of sustainability. For the first stage, it is more practical to apply approaches that are typical for sustainable agriculture. For the second stage, strategies used for similar production processes should be considered.

Regarding the first stage, studies have shown that crops for biofuels of an agricultural origin, if properly placed in the landscape, have potential to increase productivity of land types, provide diversity of markets for farmers, who produce food crops and animals, and could contribute to ecosystem services. They could serve as riparian buffers, filter strips and nutrient traps and could stabilize fragile land on a gentle slope. They could replace at least some of the non-commercial crops. [10] Further investigations have shown that if certain non-eatable plants for biofuel production are grown in an appropriate landscape, they can provide biofuel substance and enhance environmental quality and the quality of the resource base. [11]

Use of genetically modified organisms for the cultivation of energy crops has the potential to result in yield increase and less need for pesticides. This may accelerate the spreading of genetic engineering for agriculture, despite the reluctance of many involved actors. There is an opinion that co-existence of genetically engineered and conventional agriculture will not last long: it will only be a matter of time until a less hazardous form of genetic engineering spreads out, and even food crops become affected. [12] Possibly, genetically modified organisms should be discussed and regulated as a separate area, not restrictively in connection to biofuel production.

Considering the second stage of biofuel production, warnings have been made that water use for converting the prepared biofuel substance to the final product can create competition for water. [13] As an example, the amount of water required for processing biofuel substance into ethanol is estimated to be 2-6 gallons per gallon of ethanol produced. It can be recommended that biofuel refineries are located close to where the biofuel substance is produced. [14]

Biofuels sustainability has environmental, economic and social impacts that all interconnect. Tradeoffs among biofuels can vary widely. They depend on the type of the used biofuels and where crops for them are grown. [15] There is a need to consider, evaluate and explicitly compare implementation results for biofuel sustainability criteria in various frameworks and standards. Biofuel industry can suffer from referring to many sustainability issues, if not implemented in the right way. [16] The precautionary principle, which is an established practice in environmental law, suggests a careful approach to biofuel production, until a clearer understanding of their environmental impacts, based on scientific knowledge, emerges. [17] The precautionary principle also calls for caution against relying much on a single type of fuels in the transport sector, when there are alternative solutions and technologies that can be possibilities for the future. [18]

3. Advantages and Disadvantages of Transport Biofuels in Comparison to Traditional Fossil Fuels

Transport biofuels have a range of advantages in comparison to the traditional fossil fuels. Bearing in mind that resources of oil and natural gas are limited, [19] and that it is necessary to find alternative sources of energy instead of them, biofuels can be seen as one of very promising future possibilities. [20] Another aspect is that mixtures with low percentage of biofuels do not demand any technical changes in a car engine, which is convenient practically.

Partial use of biofuels instead of the traditional fossil fuels decreases the dependence of countries on oil producing nations and oil crises. Biofuels have the potential to reduce greenhouse gas (GHG) emissions, [21] when compared to the conventional transport fuels [22]. Biofuels are biodegradable and less toxic than fossil fuels. [23] They can, therefore, improve air quality. Biofuels have a potential to be cheaper than fossil fuels, if biofuel technologies become more effective economically. [24] In general, biofuels can have a positive effect on energy prices. Production of biofuels can lead to a wider economic growth and increased employment opportunities. It can promote rural development and access to energy in poorer countries. [25]

Together with the improvement of technological possibilities, the development of legal frameworks that support biofuels is taking place, both at national and international levels. This creates a reliable basis for investments and further improvement of biofuel production processes. Under these conditions it is especially important to safeguard that the quality of biofuels is sustainable. Elaboration of sustainability criteria for biofuels and their use in legal frameworks becomes a significant tool in promoting and protecting sustainability.

As far as disadvantages of biofuels are concerned, the production of biofuels involves large amounts of additional land use, which can damage the existing eco-systems. Biofuels become a profitable opportunity for farmers, who may grow crops for biofuel production instead of food production. This can increase food prices [26] and cause a rise in inflation. Biofuels' consumption in a motor vehicle engine is higher than that of petrol. The total amount of energy input into the production of biofuels remains high and unfavorable. It is uncertain to what extent burning of biofuels reduces GHG emissions, when compared to the traditional fossil fuels.

Current costs of biofuels are much higher than costs of petrol and diesel. Subsidies are needed to make biofuels competitive. [27] Biofuels, for example bioethanol, are less suitable for use in low temperatures than the conventional fuels for transport.

4. Sustainability Requirements for Transport Biofuels

Environment reacts according to natural laws, not according to legal documents we create. Laws of nature cannot be neglected. The world economy and production must therefore be limited to the carrying capacity of the Earth's biosphere and ecosystems. [28] Our social and economic development and supporting legislation should be adopted to environmental laws, so that the progress of our society does not result in an environmental collapse. [29] At the same time it is difficult not to agree that legal rules can influence the environment negatively.

Regarding biofuels that are an emerging field for national and international laws, the task of legislation can be to create well-functioning legal frameworks that will preserve the environment and facilitate economic and social growth. It can be discussed whether the goal of the biofuel legislation should be formulated as sustainable development and sustainability of the biofuel industry, which includes sustainable production, trade and use of biofuels. Preservation and improving of different ecological qualities like air, soil and water can under such conditions be natural environmental sub-goals.

It can be suggested that the production of biofuels should include minimum levels of GHG performance, criteria on biodiversity and rewards for the use of feedstock diversifying the raw material for biofuels, such as lignocellulosic material for the production of the second generation biofuels. A transfer of clean technologies to developing countries should be encouraged. Transportation and storage of biofuels need be a subject of special analysis as these factors are important in the biofuel supply chain. According to the data from 2003, transportation accounted for almost 40 % of the total costs for biofuels.

Different types of biofuels are in demand of different criteria for sustainable production. There is a set of general aspects suggested by Börjesson, which can be used to evaluate the environmental impact of biofuels. They are:

- consumption of fuels in a motor vehicle engine;
- the amount of agricultural land needed for production;
- utilization of by- and resting products; and
- emissions of methane during the growth of crops. [30]

An interesting question is what type of a producer is able to manufacture environmentally sustainable biofuels. Large companies can have better financial, technical and scientific possibilities to assess relevant sustainability factors and to operate according to the assessment. Large companies can have more opportunities to use the best available technologies. Their access to knowledge and to the latest scientific news in their production sphere is better. It is easier for them to organize and pay for the process of certification. There will be an environmental winning, if large companies, and not small-scale individual producers, organize the production of transport biofuels and raw materials for them.

From other points of view, first of all social, a shift of landownership to big farms that are owned by foreign investors is not good for local communities. Small scale production of agricultural products can have environmental advantages, for example in the form of less pressure on biodiversity.

Large scale environmental issues, like additional pressure on pristine land, cannot be assessed on a company or farm basis. A way out may be to assign certain conversion values to different states. [31]

Obviously, sustainability requirements for biofuels would differ for different types of biofuel production. Where biofuels are aimed at providing local fuel security and rural development, sustainability issues will be different from where biofuels are being produced for export as a global replacement to the traditional fossil fuels. [32]

5. Reflections and Conclusions

Biofuels can be seen as one of very promising future solutions in the transport sector as a substitute or rather a complement to the traditional fossil fuels and other technological innovations. However, the production, transportation and use of biofuels require more research, assessment of the achieved results and possibly binding legal regulations. The problem rooted here is that biofuels and the whole production branch need be sustainable.

Transport biofuels have a variety of advantages in comparison to the traditional fossil fuels. Thus, they help to avoid dependence on oil and natural gas and their imports. They have the potential to reduce GHG emissions, to promote a wider economic growth, especially in developing countries, and to increase employment opportunities. Nevertheless, there is still much uncertainty in the way sustainability of biofuels and their production methods is defined and understood. There seems to be a consensus that biofuel sustainability has environmental, economic and social impacts that all interconnect, which is in line with the frequently referred to definitions of sustainable development and sustainability.

The central issues of environmental sustainability for biofuels and their production methods, which have been highlighted and discussed in the latest investigations, are cautious and efficient use of land and water resources, preservation of biodiversity and existing eco-systems, reduction of GHG emissions through the whole production chain and avoiding competition with the market of food supply. The issue of genetically modified organisms cultivated for biofuel production should possibly be addressed as a separate and very serious issue. The use of genetically modified organisms can cause irreversible environmental damage. Therefore, additional cautions should be taken here. The precautionary principle established in environmental law suggests that this production area should be thoroughly researched first, until a clearer evidence-based understanding of genetically modified organisms and their consequences for the environment is gained. This production area should probably be regulated through the means of law, in order to avoid unnecessary risks.

Among the weak sides of the today's development in the sphere of biofuels, it can be named that there is no internationally agreed definition on what biofuels, and particularly transport biofuels are. [33] A large variety of biofuel types used for different purposes, including electricity and heating and cooling can be distinguished. Many types of biofuels are still under development or in a testing stage. From a legal perspective, a harmonized, widely-accepted definition of biofuels and their most commonly used types can be recommended. This would create more order and make the use of the concepts easier.

Sustainability requirements for biofuels will differ depending on the types and purposes of biofuel production. Sustainability issues for small-scale biofuel production for local purposes will be different from sustainability issues for biofuels that are produced as a global replacement to the traditional fossil fuels. Large-scale production of biofuels should be carefully planned. The task of law in this case may be to contribute to the sustainable production of biofuels through the use of the traditional and newly emerging legal approaches and instruments. Clearly defined sustainability criteria for a product or a production branch incorporated in a legal framework, as it has been done in Directive 2009/28/EC, can be an illustrative example.

There is a need to analyze, evaluate and explicitly compare implementation results for sustainability criteria for biofuels applied in various legal frameworks and voluntary sustainability standards. There is also a need for further extensive research.

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[5] One of the difficulties is that the term "biofuel" does not refer to a single, fully developed technology or even a single, uniform type of fuel. All biofuels are energy sources derived from biomass; see Jensen, M., & Andersen, A. H. (2013). Biofuels: a contested response to climate change. Sustainability: Science, Practice, & Policy, 9(1), 42-56.

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[7] A possible definition for biodiesel is that it is biofuel made for diesel engines from agricultural co-products and by-products such as vegetable oils and animal fats; see Diaz, M. (2013). BIODIESEL FEEDSTOCK PRE-TREATMENT STATION, p. 7.

[8] Bansal, T., Tripathi, N., & Chawla, G. (2013). Upgradation of biogas using combined method of alkaline water scrubbing and adsoption through carbon molecular sieve. In Proceedings of the International Conference on Global Scenario in Environment and Energy, Bhopal, Madhya Pradesh, India, 14-16 March 2013. (Vol. 5, No. 2, pp. 886-890). Sphinx Knowledge House, p. 886; Chmielewski, A. G., Urbaniak, A., & Wawryniuk, K. (2013). Membrane enrichment of biogas from two-stage pilot plant using agricultural waste as a substrate. Biomass and Bioenergy, p. 1.

[9] There is a wide-spread recognition that to be adopted successfully the production of biofuels should be sustainable; see e.g. Borowitzka, M. A., & Moheimani, N. R. (2013). Sustainable biofuels from algae. Mitigation and Adaptation Strategies for Global Change, 18(1), 13-25, p. 13.

[10] National Research Council of the National Academies (2010), Toward Sustainable Agricultural Systems in the 21st Century, p. 252.

[11] National Research Council of the National Academies (2010), Toward Sustainable Agricultural Systems in the 21st Century, p. 252; other positive impacts can be to help farmers maintain their profitability and prevent negative effects of land abandonment on biodiversity; see Harvolk, S., Kornatz, P., Otte, A., & Simmering, D. (2013). Using existing landscape data to assess the ecological potential of Miscanthus cultivation in a marginal landscape. GCB Bioenergy, p. 1.

[12] Ekardt, F., von Bredow, H. (2011), Managing the Ecological and Social Ambivalences of Bioenergy: Sustainability Criteria Versus Extended Carbon Markets, p. 459.

[13] Recent research indicates that demands on water supply are increasing due to growing population, more use per capita, migration of people, economic activity, and the impacts of climate change. Many regions of the world are experiencing increasing water scarcity. Water use requirements for crops for biofuels of an agricultural origin depend on the type of crops, the location where they are grown and how they are managed; see Gopalakrishnan, G., Negri, M. C., Wang, M., Wu, M., Snyder, S. W., & Lafreniere, L. (2009). Biofuels, land, and water: a systems approach to sustainability. Environmental science & technology, 43(15), 6094-6100, p. 6094.

[14] National Research Council of the National Academies (2010), Toward Sustainable Agricultural Systems in the 21st Century, p. 252.

[15] Robertson, G. P., Dale, V. H., Doering, O. C., Hamburg, S. P., Melillo, J. M., Wander, M. M., & Parton, W. (2008). Agriculture-sustainable biofuels redux. Science, 322(5898), p. 49.

[16] National Research Council of the National Academies (2010), Toward Sustainable Agricultural Systems in the 21st Century, p. 252.

[17] The present knowledge about sustainability of biofuels and their production methods is still in question. Many research studies in this field are inconsistent; see Ziolkowska, J. R. (2013). Evaluating sustainability of biofuels feedstocks: A multi-objective framework for supporting decision making. Biomass and Bioenergy, p. 2.

[18] Lin, J. (2010), The Sustainability of Biofuels: Limits of the Meta-Standard Approach, in the Governance of Clean Development, Working Paper 011, December 2010, p. 11.

[19] Mandolesi de Araújo, C. D., de Andrade, C. C., de Souza e Silva, E., & Dupas, F. A. (2013). Biodiesel production from used cooking oil: A review. Renewable and Sustainable Energy Reviews, 27, 445-452, p. 445.

[20] Biofuels have the potential to replace or reduce the dependence on the traditional fossil fuels; for further information see Brown, R. J., Keates, A. C., & Brewer, P. J. (2010). Sensitivities of a Standard Test Method for the Determination of the pHe of Bioethanol and Suggestions for Improvement. Sensors, 10(11), 9982-9993, p. 9983.

[21] The transport sector is estimated today to be one of the largest contributors to GHG emissions. It is also the sector with the highest growth rate of GHG emissions; see Kohler, J. (2013). 7 Moving away from the motor car. The challenge of transition to low carbon vehicles. Creating a Sustainable Economy: An Institutional and Evolutionary Approach to Environmental Policy, 21, 135, p. 135.

[22] Latest research based on the life cycle assessment (LCA) of the whole production process has shown that, unlike what has been anticipated, biofuels of an agricultural origin can provide a little to no benefits for GHG emission savings compared to the traditional fossil fuels. The achieved results depend much on the production methods; for further information see Kendall, A., & Yuan, J. (2013). Comparing life cycle assessments of different biofuel options. Current opinion in chemical biology, p. 1.

[23] Mandolesi de Araújo, C. D., de Andrade, C. C., de Souza e Silva, E., & Dupas, F. A. (2013). Biodiesel production from used cooking oil: A review. Renewable and Sustainable Energy Reviews, 27, 445-452, p. 445.

[24] A large variety in prices can be observed. As an example, bioethanol produced from sugarcane in Brazil is three or four times cheaper than bioethanol produced from corn in the USA; see Alonso-Pippo, W., Luengo, C. A., Alonsoamador Morales Alberteris, L., García del Pino, G., & Duvoisin Junior, S. (2013). Practical implementation of liquid biofuels: The transferability of the Brazilian experiences. Energy Policy, p. 71.

[25] Holden, E., & Gilpin, G. (2013). Biofuels and Sustainable Transport: A Conceptual Discussion. Sustainability, 5(7), 3129-3149, p. 3130.

[26] Shi, X., Goto, S. (2011), Harmonizing Biodiesel Fuel Standards in East Asia: Current Status, Challenges and Way Forward, p. 22.

[27] Up till now the production of biofuels has to a large extent been supported by national governments; see Holden, E., & Gilpin, G. (2013). Biofuels and Sustainable Transport: A Conceptual Discussion. Sustainability, 5(7), 3129-3149, p. 3130.

[28] Aras, G., Crowther, D. (2009), Corporate Sustainability Reporting: A Study in Disingenuity?, Journal of Business Ethics 2009, 87, pp. 279–288, Springer 2008, DOI 10.1007/s10551-008-9806-0, p. 280; Spangenberg, J., H. (2013), Pick Simply the Best: Sustainable Development is About Radical Analysis and Selective Synthesis, not About Old Wine in New Bottles, Helmholtz Centre for Environment Research, Halle/Saale, Germany, Sustainable Development Sust. Dev. 21, 101–111 (2013), p. 102.

[29] Westerlund, S. (2003), Miljörättsliga grundfrågor 2.0, Institutet för miljörätt (IMIR), Björklinge, p. 7.

[30] Börjesson, P. (2009), Contribution to the Conference on Climate Adaptation, 25 February 2009, Alnarp, Sweden.

[31] Delzeit, R., Holm-Müller (2009), Steps to discern sustainability criteria for a certification scheme of bioethanol in Brazil: Approach and difficulties, p. 668.

[32] Von Maltitz, G. P., & Setzkorn, K. A. (2013). A typology of Southern African biofuel feedstock production projects. Biomass and Bioenergy, p. 14.

[33] This is in spite of the fact that Directive 2009/28/EC provides definitions of such concepts as biofuels, biomass, bioliquids; see Article 2 there.

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Legal Analysis of the EU Policy for Sustainable Transport Biofuels

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Abstract The enforcement and implementation of separate aspects of sustainable development and environmental sustainability can be challenging and innovative due to the complexity of this task. Appropriate policy and legal approaches and tools can be needed for this purpose. In this article, the EU experience of developing the framework for sustainable transport biofuels and special structural elements for its enforcement are highlighted and analyzed. The central legal acts in this area, including Directive 2003/30/EC, Directive 2009/30/EC and Directive 2009/28/EC are explored. Advantages and disadvantages of the EU approach to sustainable transport biofuels are discussed. Suggestions for the future development are made. Among them, the ideas to establish an international regime for sustainable transport biofuels are promoted and reflected on. In the work, special focus is laid on the content of Directive 2009/28/EC and the requirements, which it imposes on the EU Member States. The significance of the 2020 binding targets for renewable energy is highlighted, and their possible consequences are discussed. The content of the EU sustainability criteria for biofuels is explained. The cooperation mechanisms and monitoring requirements to the EU Commission and Member States are examined. The EU approach to combine the quantity of the consumed biofuels, which has the form of the binding targets for the EU Member States, and their sustainable quality, expressed as the list of the sustainability criteria, is viewed as efficient and sustainable from an environmental perspective. Though the EU policy for sustainable transport biofuels is still under development and constant improvement, it can be seen as an instructive example of how environmental goals and policy measures can be organized and promoted with the help of binding legal regulations. Certain aspects of the EU approach to sustainable transport biofuels can be efficiently borrowed by other industrial sectors, as well as by other countries that wish to develop a framework for sustainable energy.

Keywords Transport Biofuels, EU Binding Targets, Sustainability Criteria, Directive 2009/28/EC, Environmental Law

1. Introduction

Warnings about limited oil resources, as well as the necessity to reduce GHG emissions and secure energy supply 1 have become prioritized issues on the EU agenda. It has been suggested to partially replace traditional fossil fuels with other sources of renewable energy, for example with biofuels in the transport sector. This has been seen as a promising solution for complications connected with the extraction and supply of oil, as well as for the reduction of GHG emissions. It has also become understandable that the quality of biofuels and their production methods need to be sustainable. 2 The material, from which biofuels are produced, for example cultivated energy crops, should follow certain sustainability standards. Regulating these issues with the help of sustainability criteria and a legal framework aimed to support the fulfilment of these criteria has been seen as a possible strategy to minimize environmental damage.

2. Background to the EU Policy for Sustainable Transport Biofuels

The EU policy for sustainable transport biofuels has a long history and is ambitious. EU has become one of the first

1 The gas crisis in January 2009, when Bulgaria, Slovakia, Greece, Austria, Czech Republic, Slovenia, Hungary, Poland, Romania and Croatia were seriously affected by the cut of the Russian gas supply [European Commission (2009), IP/09/30, *The Gas Coordination Group evaluates the current gas crisis and confirms measures to assist countries in need*], has shown how vulnerable the EU energy security system is. In 2007, international newspapers wrote that EU is the world's largest importer of oil and gas, importing 82 % of its oil and 57 % of its gas [Associated Press in International Herald Tribune (2007), *EU unveils plan to tackle oil and gas dependence*; the Heritage Foundation (2007), *Europe's Strategic Dependence on Russian Energy*]. According to a research from 2007, transport sector in EU depends on oil for 98 % of its fuel needs [the Engineer (2007)]. Slovakia, Hungary, Latvia, Poland and Lithuania are all more than 90 % dependent on oil supply from Russia. Greece, Italy, Portugal and Spain are more than 40 % dependent on the oil resources from the Middle East [the European Federation for Transport and Environment (2008), *EU spending €1 billion a day on oil imports as leaders backtrack on efficient cars, Briefing*]. Biofuels, particularly in the transport sector, can be seen as one of the possibilities to diminish the EU dependence on the imports of energy sources and to reduce GHG emissions.

2 Schlegel, S., Kaphengst, T. (2007), European Union Policy on Bioenergy and the Role of Sustainability Criteria and Certification Systems.

regions, which has developed a legal framework for sustainable transport biofuels.[3] One of the first binding documents in this area came as early as in 1985. It was Directive 85/536/EEC on crude-oil savings through the use of substitute fuel components in petrol, which was subsequently replaced by Directive 2003/17/EC that was related to the quality of petrol and diesel fuels.

2.1. Directive 2003/30/EC on the Promotion of the Use of Biofuels or Other Renewable Fuels for Transport

One of the major steps in the development of the EU policy for transport biofuels was made in 2003 with the legislation of Directive 2003/30/EC. This Directive, informally called the Biofuels Directive, contained nine articles and aimed to promote the use of biofuels and other renewable fuels for transport.

Directive 2003/30/EC had a long-lasting influence on the policy for transport fuels in the EU Member States. The Directive's aim, specified in Article 1, was to promote the use of biofuels or other renewable fuels, e.g. renewable-based hydrogen, to replace diesel or petrol for transport purposes. It also expressed an intention to contribute to the fulfilment of such objectives as to meet climate change commitments, maintain environmentally friendly security of supply and promote renewable energy sources.

The Directive contained a list of definitions of different types of fuels that were to be considered as biofuels. Ten sorts were named, including bioethanol, biodiesel, biomethanol and biohydrogen.[4] Biofuels were defined as liquid or gaseous fuel for transport produced from biomass.[5] *Biomass* had a definition of the biodegradable fraction of products, wastes and residues from agriculture, forestry and related industries, as well as the biodegradable fraction of industrial and municipal waste.[6]

One of the most important aspects in Directive 2003/30/EC was that it introduced indicative, non-binding targets, requiring the Member States to set an interim indicative target for 2005 of 2 % of biofuels, and an indicative target for 2010 of 5,75 % of all petrol and diesel for transport placed on the market.[7] No individual targets for separate Member States were specified. A system of strong mandatory targets was considered in the first proposal of the Directive in 2002, but a decision on its adoption was deferred to see whether indicative targets could be achieved.[8]

To be counted for the achievement of the interim targets, biofuels can be produced as:

- pure biofuels or at high concentration in mineral oil derivatives, in accordance with specific quality standards for transport applications;
- biofuels blended in mineral oil derivatives, in accordance with the appropriate European norms, describing the technical specifications for transport fuels (EN 228 and EN 590);
- liquids derived from biofuels, such as ETBE (ethyl-tertio-butyl-ether), where the percentage of biofuel was as specified in definitions in Article 2.[9]

To promote consumption of biofuels or other renewable fuels, the Member States were able to use policy instruments and measures that best fit their national conditions and domestic interests in respect of all EU regulations.[10] Failure to meet the indicative targets required the Member States to explain the discrepancy on the basis of motivations presented in Article 4.1. With other words, the Member States could legitimately differentiate from the indicative targets of the Directive, if suitable argumentation was presented.[11]

The Member States were required to monitor the effect of the use of biofuels in diesel blends above 5 % by non-adapted vehicles,[12] and to ensure that information was given to the public on the availability of biofuels and other renewable fuels.[13] The Member States were also recommended to consider the overall climate and environmental balance of the various types of biofuels and other renewable fuels. Priority might be given to the promotion of biofuels, which showed a very good cost-effective environmental balance, while taking into account competitiveness and security of supply.[14]

Directive 2003/30/EC presented regulations on the Member States' reporting obligations.[15] The Member States were to submit annual biofuel progress reports to the Commission. The reports had to contain information about such issues as the measures taken to promote the use of biofuels, the national resources allocated to the production of biomass for energy uses other than transport, as well as the total sales of transport fuels and the share of biofuels.

Further, the Member States should submit evaluation reports to the Commission every two years. As a minimum requirement, these reports had to cover national issues regarding cost-effectiveness of the measures taken to promote the use of biofuels and other renewable fuels, the economic aspects and the environmental impact of further increasing the share of biofuels and other renewable fuels, and the life-cycle perspective of biofuels and other renewable fuels. The evaluation reports had also to contain

3 Other prominent examples are US and Brazil.
4 Article 2.2. Other definitions of the terms, necessary for the understanding of the Directive, were given in Article 2.1.
5 Article 2.1.a.
6 Article 2.1.e.
7 Article 3.1; Jansen, J, Uyterlinde, M. (2004), *A fragmented market on the way to harmonisation? EU policy-making on renewable energy promotion*, p. 99; Ryan, L., Convery, F., Ferreira, S. (2006), *Stimulating the Use of Biofuels in the European Union: Implications for Climate Change Policy*, p. 3185; Kanellakis, M., Martinopoulos, G., & Zachariadis, T. (2013). European energy policy — A review, p. 2.
8 Lucia, D., L., Nilsson, L., J. (2007), *Transport biofuels in the European Union: The state of play*, p. 535.
9 Article 3.2.
10 According to the grounds of the EU law; see also Howes (2010), *Directive 2009/28/EC*, p. 122; Lucia, D., L., Nilsson, L., J. (2007) *Transport biofuels in the European Union: The state of play*, p. 533.
11 Lucia, D., L., Nilsson, L., J. (2007), *Transport biofuels in the European Union: The state of play*, p. 533.
12 Article 3.3.
13 Article 3.5.
14 Article 3.4.
15 Article 4.

information about the sustainability of crops used for the production of biofuels, particularly land use, degree of intensity of cultivation, crop rotation and use of pesticides, the assessment of the use of biofuels and other renewable fuels with respect to their differentiating effects on climate change and their impact on CO2 emission reductions and a review of further more long-term options concerning energy efficiency measures in transport.16

2.2. Development after Directive 2003/30/EC

The interim indicative target in Directive 2003/30/EC, which required 2 % of biofuels by 2005, was not fulfilled. Growth in renewable energy for transport was dominated by a few Member States. Between 2000 and 2006, only Denmark, the Czech Republic, Germany, Slovakia and Hungary increased their shares of renewable energy by more than 2 %.17 In 2005, the average use of biofuels counted to 1 % of transport fuel.18 According to the Commission, the main reasons for the failure to reach the indicative target were the lack of a coherent and effective policy framework throughout EU with a firm long-term vision and the increase in energy consumption.19

Other reasons for the weak implementation could be an uncertain connection between the policy means, i.e. biofuel consumption and the policy objectives.20 It is possible that the Member States did not feel compelled to transpose the targets.21 What is more, differences in how the Member States interpreted the objectives, with emphasis on supply security contrary to interest in self-sufficiency and in the weight different Member States put on the objectives, could be observed.22

It became clear that the framework for the promotion of biofuels and renewable energy for transport needed improvement, not least in the form of setting a new timeframe. The merely indicative national targets in Directive 2003/30/EC provided uncertain investment environment. The Commission therefore proposed a new, more rigorous framework to drive forward the development of renewable energy and more solid, legally binding targets for 2020.23

In 2006, the Commission published a detailed *EU Strategy for Biofuels*24, where the role that biofuels for transport as alternative fuels could play in the future was defined. The document also proposed measures to promote the production and use of biofuels.25 It became an important step in a long-going updating of Directive 2003/30/EC and the development of a more efficient EU policy for biofuels. Further EU publication, relevant for transport biofuels, came in 2007, with the title *Renewable Energy Road Map*26. This document proposed a biding target of 20 % for the use of renewable energy and 10 % for the share of biofuels in the transport sector by 2020. The Road Map considered biofuels as a potential mechanism, through which lifetime emissions could be reduced. Creation of a separate fuel blend was suggested, with a consequent amendment of Directive 98/70/EC on fuel quality, to allow higher percentages of biofuels in petrol and diesel. Importance to ensure that the used biofuels would be sustainable, both inside and outside EU, was emphasized.

The development of the EU policy on biofuels for transport continued in early 2007 with the communication from the Commission of *an Energy Policy for Europe*27. This document dealt with issues of energy, sustainability, industrial development and climate change in a more holistic way. The need for a coordinated promotion of biofuels throughout the EU was underlined. According to the document, the EU should engage third countries and their producers to achieve biofuel sustainability. The Commission, in its turn, would continue and intensify the use of renewable energy through other policies and flanking measures with the aim of creating a real internal market for renewables in EU.28

At the moment of writing, the EU policy for transport biofuels is primarily reflected in Directive 2009/28/EC and Directive 2009/30/EC, which are the central binding documents in this area. Directive 2009/28/EC sets binding targets for the use of biofuels in the transport sector, that each Member State shall achieve by 2020, and outlines obligatory criteria for sustainable biofuels. Directive 2009/30/EC regulates the quality of fuels. The list of the sustainability criteria from Directive 2009/28/EC is repeated in Directive 2009/30/EC almost identically. Because of that and as the structure that supports the enforcement and implementation of the sustainability criteria is more elaborated in Directive 2009/28/EC, my research is mostly based on the regulations from this legal act.

3. Directive 2009/30/EC on the Quality of Transport Fuels

Significant progress in vehicle technology, and the

16 Article 4.2.
17 Howes T. (2010), *Directive 2009/28/EC*, p. 122.
18 COM (2009) 192 final, *The Renewable Energy Progress Report*, Communication from the Commission.
19 COM (2006) 545 final, *Action plan for energy efficiency: realising the potential*, Communication from the Commission; de Alegría Mancisidor, I. M., Díaz de Basurto Uraga, P., Martínez de Alegría Mancisidor, I., & Ruiz de Arbulo López, P. (2009), *European Union's renewable energy sources and energy efficiency policy review: The Spanish perspective*, p. 103; Gullberg, A., T. (2011), *The European Union renewable directive: The policy-making process and the stakeholders' positions*, p. 4.
20 Lucia, D., L., Nilsson, L., J. (2007), *Transport biofuels in the European Union: The state of play*, p. 540.
21 Lucia, D., L., Nilsson, L., J. (2007), *Transport biofuels in the European Union: The state of play*, p. 541.
22 Lucia, D., L., Nilsson, L., J. (2007), *Transport biofuels in the European Union: The state of play*, p. 541.
23 COM (2009) 192 final, *The Renewable Energy Progress Report*, Communication from the Commission.
24 COM (2006) 34 final, *An EU Strategy for Biofuels*, Communication from the Commission.
25 COM (2006) 34 final, *An EU Strategy for Biofuels*, Communication from the Commission, p. 7.
26 COM (2006) 848 final, *Renewable Energy Road Map. Renewable energies in the 21st century: building a more sustainable future*, Communication from the Commission.
27 COM (2007) 1 final, *An Energy Policy for Europe*, Communication from the Commission.
28 COM (2007) 1 final, *An Energy Policy for Europe*, Communication from the Commission, p. 14.

development and better availability of biofuels, urged the revision of the specifications for fuel quality contained in Directive 98/70/EC. The result was a new Fuel Quality Directive (2009/30/EC) that considered petrol, diesel and biofuels, and introduced a mechanism to monitor and reduce GHG emissions. This Directive has very much in common with Directive 2009/28/EC, and was adopted during the same period in April 2009. The aim of Directive 2009/30/EC is to reduce the emission of air pollutants released from transport fuels, and to facilitate the achievement of the EU's 2020 target for transport. The Member States had to transpose Directive 2009/30/EC into national legislation by 31 December 2010.

Article 1 states the scope of Directive 2009/30/EC, which, in respect of road vehicles and non-road mobile machinery, agricultural and forestry tractors, gives technical specifications on health and environmental grounds for fuels, as well as sets a target for the reduction of life cycle GHG emissions. Article 2 provides definitions of the central terms that are used in the Directive including the expressions "life cycle GHG emissions", "GHG emissions per unit of energy" and biofuels. The term biofuels has the same meaning as in Directive 2009/28/EC.29 The terms bioliquids and biomass are not defined. "A supplier" means in the Directive the entity responsible for passing fuel or energy through an excise duty point or, if no excise is due, any other relevant entity designated by a Member State.30

One of the central articles in the Directive is Article 7.a, which concerns the reductions of GHG emissions. According to it, the Member States shall designate suppliers, responsible for monitoring and reporting life cycle GHG emissions per unit of energy from fuel and energy supplied. From 1 January 2011, suppliers shall report annually to the authorities in the Member States on the GHG intensity of fuel and energy supplied in each Member State. Suppliers shall provide the minimum information about the total volume of each type of fuel or energy supplied, indicating its origin and life cycle GHG emissions per unit of energy. Article 7.a (point 2) also regulates that the Member States shall require suppliers to reduce gradually life cycle GHG emissions per unit of energy from fuel and energy supplied by up to 10 % by December 2020. The Member States may require suppliers, for this reduction, to comply with the following intermediate targets: 2 % by 31 December 2014 and 4 % by 31 December 2017. To add to this, the reduction shall include indicative additional targets of 2 % by 31 December 2020. Since the fuel producers are free to choose how the targets are achieved, it is expected that the demand for biofuels with a "good-for-the-environment" GHG balance could increase.31

Life cycle GHG emissions from biofuels shall be calculated in accordance with Article 7.d, which contains the same calculation methodology as Article 19 and Annex V in Directive 2009/28/EC. The Member States shall provide suppliers with an opportunity to meet the reduction obligations jointly.

To add to Article 7.d, there are several other Articles in Directive 2009/30/EC that regulate similar issues as Directive 2009/28/EC and have almost identical content. The only significant difference is that Articles in Directive 2009/30/EC refer to biofuels, and Directive 2009/28/EC considers both biofuels and bioliquids. In such a way, Article 7.b in Directive 2009/30/EC, which defines sustainability criteria for biofuels, corresponds to Article 17 in Directive 2009/28/EC, which defines sustainability criteria for biofuels and bioliquids. Article 7.c in Directive 2009/30/EC, which deals with control of the fulfilment of the sustainability criteria for biofuels, corresponds to Article 18 in Directive 2009/28/EC that regulates the same issue. Article 7.e with the title "Implementing measures and reports, concerning the sustainability of biofuels", partially has the same content as Article 20 in Directive 2009/28/EC, but is broader, as it also regulates the EU Commission's reporting obligations to the European Parliament and the Council.

More detailed rules on the reporting obligations of the Commission can be found in Article 9 in Directive 2009/30/EC, which states that by December 2012, and every three years after that, the Commission shall submit a report to the European Parliament and the Council. The report shall be accompanied, where appropriate, by a proposal for amendments. The report shall contain data about the feasibility of increasing the maximum permitted biofuel content of petrol and diesel, the total volume of components used in petrol and diesel, the EU policy on CO2 emissions from road transport vehicles, and the consequences of the GHG reduction target for the emissions trading scheme. The need for adjustments in the Directive in order to assess possible contributions for reaching the 2020 target for transport shall also be included.

By 2014, the Commission shall submit another report about the achievement of the GHG emission target for 2020, as it is formulated in Article 7.a. If appropriate, modification of the target shall be discussed.

4. Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources

In January 2008, the EU Commission proposed a new draft Directive on the promotion of renewable energy. In the course of negotiations, environmental concerns about the production of biofuels were significant. The need to develop efficient sustainability standards for biofuels and to reflect on possible consequences of the biofuel policy was emphasized. The influence of the biofuel policy on food security and possible GHG emission savings from biofuels were discussed much. Other concerns were about the impact on competition for land, the use of water and land resources

29 Article 2.a.ii.9, Directive 2009/30/EC.
30 Article 2.a.ii.8.
31 Majer, S., Mueller-Langer, F., Zeller, V., Kaltschmitt, M. (2009), *Implications of biodiesel production and utilization on global climate – A literature review*, p. 753.

and on possible loss of biodiversity.32 Resulting Directive 2009/28/EC, also called the Renewable Energy Directive, was formally adopted in April 2009. In some aspects it was less ambitious than its draft.

The most prominent innovations in Directive 2009/28/EC, which is central in the present EU framework for transport biofuels, can be formulated as follows:

- It sets mandatory national targets for renewable energy shares, including 10 % of renewables for transport share, in 2020 (Article 3);
- It requires National Renewable Energy Action Plans (Article 4);
- It establishes cooperative mechanisms between the Member States, as well as the Member States and third countries (Articles 7 – 11);
- It strives to reduce administrative and regulatory barriers (e.g. Article 13), and to improve the provision of information and training (e.g. Article 14); and
- It makes initial steps in promoting sustainability criteria for biofuels (Article 17).

4.1. The Scope of Directive 2009/28/EC and its Definitions

The intention of Directive 2009/28/EC is to establish a common framework for the promotion of energy from renewable sources. The Directive sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy, as well as mandatory national targets for the share of energy from renewable sources in transport. It establishes sustainability criteria for biofuels and bioliquids.33

Definitions of concepts that are applied in the Directive include definitions of different types of energy, biomass, biofuels, bioliquids and guarantee of origin.34 *Biofuels* are defined as liquid or gaseous fuel for transport produced from biomass.35 *Bioliquids* have a definition of liquid fuel for energy purposes other than for transport, including electricity and heating and cooling, produced from biomass.36 *Biomass* is defined as the biodegradable fraction of products, wastes and residues from biological origin from agriculture, forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste.37 Biofuels have the same definition as in earlier Directive 2003/30/EC. The definition of biomass is more detailed in comparison to the earlier legislation. Bioliquids were not defined in Directive 2003/30/EC.

From the perspective of this research, the legal definitions are important for understanding, which technical products are regarded as biofuels. The central issues of Directive 2009/28/EC, which are relevant for the thesis, are presented below.

4.2. Binding Targets for the Member States

The Directive mandates that a 20 % share of final energy consumption38 in EU must come from renewable sources by 2020.39 Each Member State's contribution is distributed differentially among the Member States, basing on national income, previously installed capacity and potential for the expending of the renewable energy.40 The individual shares in 2005 and the 2020 targets for each Member State can be found in Annex I, part A of the Directive. To take an example, the share of energy from renewable sources in 2005 for Sweden was 39.8 %. The 2020 target for renewable energy sources, which Sweden must achieve, is 49 %, which is the highest percentage among the Member States. For the UK, the figures are 1.3 % for 2005 and 15 % for 2020.

Each Member State shall promote and encourage energy efficiency and energy saving.41 The Member States shall introduce measures that are designed to ensure that the share of energy from renewable sources equals or exceeds that shown in the indicative trajectory set out in Annex I, part B.42

Regulations in Article 3.4 of the Directive are especially important for my research. They mandate that each Member State shall achieve *a 10 % share for renewables in the transport sector by 2020*. In meeting this target, considerable emphasis is put on the role of biofuels. The 10 % target in the transport sector has been set at the same level for each Member State. This has been done in order to ensure consistency in transportation fuel specifications and availability.43 Member States that do not have the relevant resources to produce biofuels are encouraged to obtain renewable transport fuels from elsewhere,44 for example importing them from third countries.

Both the 20 % and 10 % EU targets are of a minimum

32 Howes, T. (2010), Directive 2009/28/EC, p. 140.
33 Article 1.
34 Article 2.
35 Article 2.i.
36 Article 2.h.
37 Article 2.e.

38 Scarlat, N., Dallemand, J. F., & Banja, M. (2013). Possible impact of 2020 bioenergy targets on European Union land use. A scenario-based assessment from national renewable energy action plans proposals, p. 596; the concept "final energy consumption" includes the energy commodities delivered for energy purposes to industry, transport, households, services including public services, agriculture, forestry and fisheries, including the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission (Article 2.f, Directive 2009/28/EC). The calculation of the 2020 target in terms of final energy consumption can be explained by the willingness to be consistent with the existing legislative arrangements in EU [Howes T. (2010), Directive 2009/28/EC, p. 127].
39 Article 3.1; among the main purposes of this mandatory target, there is to provide certainty for investors and to encourage technological development allowing for energy production from all types of renewable sources. To ensure that this mandatory target is achieved, each Member State has to follow an indicative trajectory towards the achievement of their individual national targets (point 14, the Preamble); more information can be found at the European Biofuels Technology Platform, http://www.biofuelstp.eu/, last visited 23-09-2013.
40 De Vita, A., de Coninck H., McLaren, J., Cochran, J. (2009), *Climate for Collaboration: Analysis of US and EU Lessons and Opportunities in Energy and Climate Policy*, p. 23.
41 The last sentence of Article 3.1.
42 Article 3.2.
43 Haga, A., Rabben, J. (2010), *Norway: EU Renewable Policy and Legislative Developments*.
44 Point 16, the Preamble; see also the European Biofuels Technology Platform, http://www.biofuelstp.eu/, last visited 23-09-2013.

character.45

4.3. Calculation Methods for the Binding Targets

Biofuels and bioliquids, which do not fulfil the sustainability criteria set out in the Directive, shall not be taken into account, when the final consumption of energy from renewables is calculated.46 The energy content of the transport fuels listed in Annex III shall be taken as it is expressed there.47 For bioethanol, energy content by weight is 27 MJ/kg, and energy content by volume is 21 MJ/l. The corresponding parameters for biodiesel are 37 MJ/kg and 33 MJ/l, for traditional petrol 43 MJ/kg and 32 MJ/l, and for traditional diesel 43 MJ/kg and 36 MJ/l.

For the purposes of demonstrating compliance with national renewable energy obligations and the target for the use of energy from renewable sources for transport, the contribution made by biofuels produced from wastes, residues, non-food cellulosic material and ligno-cellulosic material shall be considered to be twice that made by other biofuels.48 The Directive does not contain definitions of "waste" and "residues". The Commission considered that these concepts should be interpreted in line with the objectives of Directive 2009/28/EC. 49 There is an explanation from the preparatory works that waste, in this context, can be understood as any substance or object, which the holder discards or intends or is required to discard, including materials that have to be withdrawn from the market for health or safety reasons. Raw materials that have been intentionally modified to count as waste (e.g. by adding waste material to a material that has not been waste), should not be considered as qualifying for the 10 % binding target.50

The initiative to count biofuels produced from wastes, residues, non-food cellulosic material and ligno-cellulosic material double can be explained by environmental benefits, which these production materials have, in comparison to biofuels produced from crops of an agricultural origin.

4.4. Cooperation Mechanisms for the Achievement of the Binding Targets

There are three elements of cooperation mechanisms in the Directive: statistical transfers between the Member States (Article 6), joint projects between the Member States (Articles 7 and 8), and between the Member States and third countries (Articles 9 and 10), and joint support schemes (Article 11).

Statistical transfers are based on agreements between the Member States to transfer a quantity of renewable energy produced in one Member State to another Member State for the purpose of target achievement. The transfer is virtual, and it does not require accompanying energy flow.51 The transfer shall not affect the achievement of the national target of the Member State making the transfer.52 The transfer opportunity exists so that the Member States with significant renewable energy sources, or with effective support schemes, can offer spare renewable energy to other Member States. It is expected that transfer agreements would be made for several years.53

Joint projects between the Member States are also promoted by the Directive. 54 The Member States may cooperate on all types of joint projects relating to the production of electricity, heating or cooling from renewable energy sources. Private operators may be involved in this cooperation. 55 The Member States shall notify the Commission about the amount of electricity, heating or cooling from renewable energy sources produced by any joint project in their territory, which became operational after 25 June 2009, or by the increased capacity of an installation that was refurbished after that date.56

In practice, a joint project may cover a broad spectrum of actions, including building or co-financing of infrastructure or even an energy purchase agreement. The intention behind the mechanism is the same as for statistical transfers, namely to facilitate renewable energy production and sharing of the resulting energy towards two or more Member States' national targets, with the final aim to reduce the overall cost of reaching the 2020 targets.57

According to the regulations of joint support schemes,58 the Member States may agree to join or coordinate their national support schemes (e.g. a common feed-in tariff or green-certificate regime 59). Under certain conditions, expressed in the Directive, some amount of energy from renewable sources produced in the territory of one participating Member State may count towards the national overall target of another participating Member State.

The central idea of the cooperation mechanisms is for the Member States to fulfil part of the 2020 binding targets in another country by providing financial support, with the potential advantage of accessing cheaper production of renewable energy in other countries. 60 The Preamble encourages the Member States to pursue all appropriate forms of cooperation in relation to the objectives set out in Directive 2009/28/EC.61 Compatibility of the cooperation mechanisms from Directive 2009/28/EC with the EU competition law is an issue that requires further investigation. However, it lies outside the central focus of this research.

Most Member States have continued to focus on national

45 European Commission, Mobility and Transport, *Clean Urban Transport*; European Commission, Strategic Energy Technologies Information System SETIS (2013), *Biofuels*.
46 Article 5.1, 3.d line.
47 Article 5.5.
48 Article 21.2.
49 Communication (2010/C 160/02), p. 5.2.
50 Communication (2010/C 160/02), p. 5.2.
51 Howes, T. (2010), Directive 2009/28/EC, p. 133.
52 Article 6.
53 Howes, T. (2010), Directive 2009/28/EC, p. 133.
54 Articles 7 and 8.
55 Article 7.1.
56 Article 7.2.
57 Howes, T. (2010), Directive 2009/28/EC, p. 133.
58 Article 11.
59 Howes, T. (2010), Directive 2009/28/EC, p. 133.
60 Kanellakis, M., Martinopoulos, G., & Zachariadis, T. (2013). European energy policy — A review, p. 3.
61 Point 35, the Preamble.

resources to achieve their 2020 targets on their own. They have not sought to reduce costs by developing cheaper resources in other parts of the single market.62

Beyond the named possibilities for cooperation, a medium to long term EU cooperation strategies can be developed, in order to make the energy sector function cost efficiently.63

4.5. Sustainability Criteria for Transport Biofuels

The sustainability criteria for biofuels, which have not been set for other issues than environmental sustainability, are presented in Article 17 of Directive 2009/28/EC. They are relevant for all types of biofuels, both liquid and gaseous, as well as for bioliquids used for other energy purposes than transport. Four types of the sustainability criteria from Article 17 can be distinguished:

1. biofuels shall achieve a minimum level of GHG savings, (carbon stock losses from land use change are not to be included in this calculation), Article 17.2;
2. land with high biodiversity shall not be converted for biofuel production, Article 17.3;
3. land with high carbon stocks shall not be converted for biofuel production, Article 17.4; and
4. land that was peatland in January 2008 shall not be used for the production of raw materials for biofuels, Article 17.5.

Only biofuels that fulfil the sustainability criteria from Article 17 can be counted for the achievement of the 10 % of renewable energy goal in the transport sector.64 The same is about receiving financial support for the consumption of biofuels: it can only be given for biofuels, which fulfil the sustainability criteria of Article 17. This is stated in Article 17.1. The sustainability criteria are applicable equally to domestically produced and imported biofuels. 65 This implies that biofuels can be imported into EU, even if they do not meet the sustainability criteria, but compliance is required in order for biofuels to count towards the achievement of the EU or national renewable energy obligations, or to be eligible for financial support.

Biofuels produced from waste and residues, other than agricultural, aquaculture, fisheries and forestry residues, need only fulfil the sustainability criterion set out in Article 17.2, i.e. the requirements for GHG emission savings, in order to be taken into account for the above named purposes.66 This condition can be explained by the fact that other sustainability criteria in Article 17, due to their nature, are not directly applicable on biofuels that are produced from waste and residues. This also indicates that different types of biofuels would need different sustainability criteria, depending on the production material.

Article 17.2 of Directive 2009/28/EC regulates *the first type of the EU sustainability criteria*, which contains requirements for GHG emission savings, in comparison to traditional fossil fuels, stating that the savings shall be at least 35 %, rising to 50 % from 2017. Calculation methods for this sustainability criterion are presented in Article 19.1.67 These methods can be viewed as a tool to measure and control the fulfillment of the first sustainability criterion.

The second type of the EU sustainability criteria is formulated in Article 17.3, which focuses on biodiversity protection. The paragraph defines areas, from which raw materials for the production of biofuels are not to be originated. These areas, considered as "highly diverse", cover primary forests and other wooded land with no indication of human activity, as well as areas designated for nature protection purposes. It is also not permitted to take into account raw materials from areas, which protect rare, threatened or endangered eco-systems. An exception is provided for materials taken from land, in relation to which it can be shown that the production of biofuel feedstocks has not interfered with conservation efforts. Raw materials taken from highly diverse grassland are also prevented from being used to meet the 2020 targets. On the basis of these definitions, indicators can be created for the assessment of how this sustainability criterion is fulfilled.

Article 17.4 contains *the third type of the EU sustainability criteria*, which is aimed to protect areas that in January 2008 or after it were with high carbon stock, such as wetlands and continuously forested areas. Raw materials for the production of biofuels are not to be originated from these types of land either.

Article 17.5 formulates *the fourth* and the last *type of the EU sustainability criteria*, which has the purpose to protect land that was peatland in January 2008, due to its high carbon value, unless there is evidence that the cultivation of that raw material does not involve drainage of previously undrained soil. Some researchers distinguish only three types of the EU sustainability criteria for transport biofuels, meaning that the issue about land that was peatland should not be addressed separately.

The requirements in Article 17.6 that address the so-called agro-environmental practices contain norms for agricultural raw materials that are cultivated in EU and used for the production of sustainable biofuels.68 Unlike the majority of the sustainability criteria, verification of compliance for this criterion is not addressed in Directive 2009/28/EC.69 The Member States should apparently rely on their national control systems for ensuring that farmers fulfil these requirements.70 The intention with the regulation in Article

62 COM (2011) 31 final, Renewable Energy: Progressing towards the 2020 target, Communication from the Commission, p. 11.
63 COM (2011) 31 final, Renewable Energy: Progressing towards the 2020 target, Communication from the Commission, p. 11.
64 Article 17.1.
65 This idea is expressed in COM (2008) 30, 20 20 by 2020 Europe's Climate Change Opportunity, Communication from the Commission; Afionis, S., Stringer, L., C. (2012), The European Union leadership in biofuels regulation: Europe as a normative power?
66 Article 17.1.
67 Afionis, S., Stringer, L., C. (2012), The European Union leadership in biofuels regulation: Europe as a normative power?
68 These raw materials shall be obtained in accordance with the requirements and standards referred to in Council Regulation (EC) No 73/2009.
69 Article 18.1.
70 Commentaries on this criterion are from Communication (2010/C 160/02), p. 2.1.

17.6 is that it would facilitate the establishment of common rules for direct support schemes for farmers under the common agricultural policy.

Due to the fact that the sustainability criteria have been adopted according to Article 95 of the EC Treaty, which contains internal market regulations, a Member State cannot on other sustainability grounds than those presented in Article 17 refuse to take into account biofuels for the purposes that are named in Article 17.1, i.e. the achievement of the 2020 renewable energy targets or a possibility for financial support.[71] With other words, a Member State does not have the right to establish stricter sustainability criteria for this purpose.

The Commission may also recognize areas for the protection of rare, threatened or endangered ecosystems, or species recognized by international agreements or included in lists drawn up by intergovernmental organizations or the International Union for the Conservation of Nature. The Commission may decide that land that falls within the scope of a national or regional recovery program, aimed at improving severely degraded or heavily contaminated land, should fulfil the criteria referred to in point 9 of part C of Annex V.[72] These criteria, or rather definitions, are:

a) "severely degraded land" means land that for a significant period of time, has either been significantly salinated or presented significantly low matter content and has been severely eroded; and
b) "heavily contaminated land" means land that is unfit for the cultivation of food and feed due to soil contamination (Annex V, part C, point 9).

4.6. Monitoring: Providing Transparency and Information to Public

Monitoring plays an important role in the EU framework for transport biofuels. According to the explanations in the Preamble, the Commission should monitor the supply of the EU market for biofuels.[73] It is appropriate to monitor the impact of biofuel cultivation, such as through land-use changes, including displacement, the introduction of invasive alien species and other effects on biodiversity, and effects on food production and local prosperity.[74]

Among monitoring measures expressed in Directive 2009/28/EC, there are requirement of transparency to the public of certain information[75] and the obligation to provide information.[76] It is underlined in the Preamble that it is necessary to set transparent and unambiguous rules for calculating the share of energy from renewable sources and for defining these sources.[77]

As an additional issue, Directive 2009/28/EC requires the Member States to closely monitor the impacts of biofuel consumption and to explore the application of sustainability criteria for biomass in general, which can be seen as a positive initiative for the promotion of sustainable biofuels.

To follow the transparency requirement, the Commission shall establish an online public Transparency Platform. This Platform shall serve to increase transparency and facilitate and promote cooperation between the Member States.[78] The Commission shall particularly make public information about the Member States' National Renewable Energy Action Plans, Member States' national reports,[79] and the Commission reports.[80] Where necessary, the confidentiality of commercially sensitive information shall be preserved.[81]

At present, the Transparency Platform of the Commission can be found at http://ec.europa.eu/energy/renewables/transparency_platform/transparency_platform_en.htm.[82] It contains different documents of the Member States and the Commission, including the Commission's progress reports on the Member States' advancement in achieving the targets for renewable energy, the Member States' Action Plans, the Commissions reports on the implementation of different Articles of the Directive and other related documents.

The Member States shall ensure that information on support measures is made available to all relevant actors, including consumers, builders, installers and suppliers.[83] The Member States, with the participation of local and regional authorities, shall develop suitable information, awareness-raising guidance or training programs, in order to inform citizens of the benefits and practicalities of developing and using energy from renewable sources.[84]

The Member States shall ensure that information is given to the public on the availability and environmental benefits of all different renewable sources of energy for transport. When the percentages of biofuels, blended in mineral oil derivatives, exceed 10 % by volume, the Member States shall require this to be indicated at the sales points.[85] The Member States are not prohibited from making information about sustainable biofuels public.[86]

4.7. Other Relevant Regulations in Directive 2009/28/EC

Article 20 in Directive 2009/28/EC refers to supplementations that should be made to the Directive's regulations on the sustainability criteria, and that these supplementations shall take into consideration regulations in Directive 2009/30/EC about fuels quality. A clear connection between Directive 2009/28/EC and Directive 2009/30/EC can be observed.

The Member States shall clearly define technical

71 Article 17.8.
72 Article 18.4.
73 Point 16, the Preamble.
74 Point 78, the Preamble.
75 Article 24.
76 Articles 14 and 21.
77 Point 11, the Preamble.
78 Article 24.1.
79 Referred to in Article 22.
80 Referred to in Article 23.3.
81 Article 24.
82 The web-site was visited last 23-09-2013.
83 Article 14.1.
84 Article 14.6.
85 Article 21.1.
86 Communication (2010/C 160/02), p. 2.5.

specifications 87 that must be met by renewable energy products and equipment, in order to benefit from support schemes. Where European standards exist, including eco-labels, energy labels and other technical reference systems established by the European standardization bodies, such technical specifications shall be expressed in terms of those standards. 88

For matters related to the sustainability of biofuels and bioliquids, the Commission shall be assisted by the Committee on the Sustainability of Biofuels and Bioliquids. 89 The Member States shall communicate to the Commission the text of the main provisions of national law, which they adopt in the field covered by the Directive. 90

The Member States may encourage investment in research and development in relation to those and other renewable energy technologies that need time to become competitive. 91

5. Development after Directive 2009/28/EC

In 2010, EU adopted a package of two communications and a decision, providing non-binding guidance on the content of the sustainability criteria. 92 Among the recommendations from the Commission, there has been an emphasis on the protection of undisturbed natural areas. The documents have highlighted that biofuels should not be made from raw materials from tropical forests or recently deforested areas, drained peatland, wetland or highly biodiverse areas. Guidelines for assessing this sustainability criterion have been set out, and the conversion of forest for oil palm plantations has been explicitly prohibited. The extent to which this prohibition is legally binding for land owners and biofuel producers outside EU can be discussed. The documents from 2010 have promoted biofuels with high GHG savings further.

According to Communication 2010/C 160/02, the EU sustainability criteria for biofuels would apply equally to domestically produced and imported biofuels. 93

At present, the EU Commission works closely with CEN (the European Committee for Standardization) for the development and continuous improvement of standards. The work, carried out by CEN Technical Committee 383, is to assist economic operators in providing evidence for the provisions relating to the EU sustainability criteria for biofuels. CEN Technical Committee 383 consists of experts from the fuel industry, energy suppliers, biofuels producers, certification bodies as well as various stakeholders. The actual CEN/TC 383 Standards are still in their draft form, but can be used by economic operators and the Member States in relation to the sustainability criteria. To take an example, two types of standards can be mentioned:

- prEN 16214-2 on *Conformity assessment including chain of custody*, which presents work on the implementation of the mass balance method of custody chain management as well as the adequate standard of independent auditing, as set out in respectively Article 18.1 and Article 18.3 of Directive 2009/28/EC, and
- prEN 16214-3 on *Biodiversity and environmental impacts*, which presents elaboration on the provision of evidence that the production of raw material has not interfered with nature protection purposes (compare with the requirements in Article 17.3.b of Directive 2009/28/EC), that the harvesting of raw material is necessary to preserve grassland's status (compare with the requirements in Article 17.3.c.ii of Directive 2009/28/EC), and that the cultivation and harvesting of raw material does not involve drainage of previously undrained soil (compare with the requirements in Article 17.5 of Directive 2009/28/EC). 94 It should be noted that the Commission has to establish the criteria and geographic ranges to determine which grassland can be considered to be highly biodiverse grassland.

The close connection of the EU sustainability criteria for biofuels with the CEN standards will increase the use and influence of the EU criteria at the international arena. This will also contribute to the harmonization of the existing legal frameworks and voluntary sustainability standards for transport biofuels. The CEN standards can also function as the basis for emerging legal frameworks and sustainability standards, as well as for multilateral and bilateral agreements. 95

Other tendencies for the future are, that the EU Commission has invited the Member States to implement their National Action Plans, created according to the target setting in Directive 2009/28/EC, and to make infrastructure planning strategies more efficient. At the same time the Commission calls to respect the existing environmental law of EU and, conforming to best practices, develop various cooperation mechanisms. In spite of reforms of the existing national environmental legislations, stability for investors should be guaranteed and retroactive changes should be avoided. 96

NGOs might have interest to combine the EU binding

87 For example technical specification for such renewable energy products as photovoltaics, solar thermal and heat pumps, the information can be found in ECORYS (2008), *Assessment of non-cost barriers to renewable energy growth in EU Member States – AEON*, p. 16.
88 Article 13.2.
89 Article 25.2 point 2.
90 Article 27.2.
91 Point 89, the Preamble.
92 Communication (2010/C 160/01) on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme, Communication (2010/C 160/02) on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels, and Decision C(2010) 3751 on guidelines for the calculation of land carbon stocks.
93 Communication (2010/C 160/02), p. 1.
94 European Commission, Biofuels, Sustainability Criteria http://ec.europa.eu/energy/renewables/biofuels/sustainability_criteria_en.htm; last visited 24-09-2013.
95 Biomass Technology Group, BTG (2008), *Sustainability Criteria & Certification Systems for Biomass Production*, p. 91.
96 Communication from the Commission COM (2011) 31 final, *Renewable Energy: Progressing towards the 2020 target*, pp. 14 – 15.

sustainability criteria with additional voluntary criteria into a very solid voluntary sustainability standard for biofuels. Producing companies might have interest to develop voluntary sustainability standards to meet the market demands created by the EU policy for transport biofuels.97 Collaboration between these groups of actors and research institutes has the potential to improve the quality and implementation of sustainability criteria for biofuels considerably.

6. Discussion of the EU Policy for Sustainable Transport Biofuels

The discussion of the EU policy for sustainable transport biofuels consists of two main parts: general reflections on the EU approach to the promotion and support of sustainable transport biofuels, and a more specific discussion of its central legal framework Directive 2009/28/EC. The strong and weak sides of the EU policy for sustainable transport biofuels and Directive 2009/28/EC are analyzed. Suggestions for the future development of the EU policy for sustainable transport biofuels and relevant legislation are provided.

6.1. General Reflections on the EU Policy for Sustainable Transport Biofuels

Judging from the material, presented and investigated in the previous sections, the EU policy for sustainable transport biofuels is logical, clear and consequent. A large variety of the EU legal and non-binding policy documents in this area emphasize mainly the same central issues. Among the advantages of transport biofuels in comparison to traditional fossil fuels, it is continuously underlined that biofuels are aimed to reduce GHG emissions, secure energy supply and create new job opportunities.98 Other positive impacts that the subsequent development of the EU policy for sustainable transport biofuels is expected to have is a long-term stability, which reduces investment risks for the business community and provides rational financial grounds for increased investments, as well as regional development, primarily in rural areas.

In the beginning, the EU policy has only been directed at the quantitative development of biofuels. The stress was put on how much the EU Member States' consumption of biofuels should be. This approach was reflected by imposing quantitative targets for biofuels. Later, attention has been paid to the quality of biofuels: in the Directives from 2009, a set of binding sustainability criteria for biofuels has been presented. The approach, when the quantity of the consumed biofuels is combined with their sustainable quality seems to be efficient from an environmental perspective.

Though the EU legal and policy documents in the researched area provide a convincing impression, they generate some critical thinking. For example, while the 2005 quantitative targets for biofuels, formulated in Directive 2003/30/EC have not been achieved, EU has set new stricter targets that are to be achieved by 2020. It is questionable to what extent this approach is reasonable and useful.

There is an opinion that biofuels as a source of renewable energy are not the only possible solution for the transport sector. Other alternatives can be very promising, such as electricity and hybrid motor vehicles. 99 This approach should be taken into account, particularly because it is not realistic to produce as much biofuels, as are needed to replace all traditional fossil fuels. The EU policy documents should perhaps contain more reflections on the fact that biofuels are not the only possibility for the future. There are other alternatives with a very good potential.

While analyzing the EU legal and policy documents, a broader perspective on how the EU transport sector should look like in the future is missing. The binding targets for the renewable energy for transport have been set, and this has been a considerable step forward. However, the future development of the EU transport sector beyond these targets is also of much importance. Possibly, various developmental models or scenarios should be suggested and discussed.

As it looks like today, it is not economically profitable to cultivate crops of an agricultural origin for the production of biofuels in EU. This means that large amounts of biofuels, which will be used to achieve the EU binding targets, should be imported from other places, e.g. developing countries. This aspect could be stressed and explained more in the EU policy documents. It is questionable, whether EU has the right to set internal environmental goals that to a greater extent depend on export from developing countries. It can happen that developing countries lack technological and other solutions, including legal frameworks, social conditions and infrastructure, required for the sustainable production and export of biofuels. There are risks that a large-scaled production of biofuels can deteriorate ecological systems in developing countries.

When setting the EU targets for renewable energy, it can be reasonable to require that a certain per cent of sustainable transport biofuels is produced inside EU. It can be discussed, whether binding regulations on the production of sustainable and cost-effective biofuels inside EU should be developed. This can be done with the purpose to make the whole production and trade chain of transport biofuels more sustainable. Further research on this question should be done.

In dealing with the challenge of domestic production in EU, hope can be laid on biofuels produced from wastes, residues and non-food cellulosic material. With their help, the percentage of locally produced biofuels can be

97 Biomass Technology Group, BTG (2008), *Sustainability Criteria & Certification Systems for Biomass Production*, p. 92.
98 Di Lucia, L. (2013). Too difficult to govern? An assessment of the governability of transport biofuels in the EU, p. 2.
99 Börjesson, P., Ericsson, K., di Lucia, L., Nilsson, L., Åhman, M. (2008), Hållbara drivmedel – finns de?, p. 49.

increased. 100 However, not everything is clear. Firstly, biofuels produced from wastes, residues and non-food cellulosic material are not in mass production they are still in a research phase. 101 At present, there is no better alternative than a large-scaled import of biofuels of an agricultural origin. Secondly, it does not sound sustainable to assume that biofuels produced from wastes, residues and non-food cellulosic material will solve all the problems, which biofuels of an agricultural origin have not been able to solve.

The EU policy for sustainable transport biofuels reflects how EU interprets the concept of sustainability in the area of biofuel industry. 102 Does EU have any ethical right to impose its sustainability concerns on other world states? How will the involved actors, including producers of transport biofuels in developing countries, react to the EU initiatives? Have their opinions been taken into account, when the EU sustainability criteria for transport biofuels have been formulated? All these questions are in demand of subsequent analysis.

Creation of an international regime for sustainable transport biofuels, where all aspects important for the global sustainability and carrying capacity of the Earth's biosphere and ecosystems are taken into consideration, can be a desirable solution. Apparently, the EU policy is not sufficient to establish a transcontinental sustainable production of biofuels. Possibilities to meet bilateral and multilateral agreements between EU and countries that produce biofuels, without coming into conflict with the WTO regulations, should be thought over. 103

The establishment of an international regime for sustainable transport biofuels can be started with the elaboration of soft law principles, relevant for this purpose. Though soft law principles do not per se have binding normative force, they can have much legal relevance. 104 The advantage of soft law principles in this situation is that it would not take much time to negotiate and enforce them, in comparison to binding international agreements. The regime formation can involve compulsory and voluntary initiatives with various degrees of public and private participation at different levels. Governing measures, cooperation and input of NGOs, large and small industries and regional representatives are just a few suggestions. 105

The drawback of this approach is that it can be problematic to influence countries with different, sometimes contradictory interests to join an international environmental regime. Another drawback is that even if a desirable number of countries-participants is found, the creation and subsequent development of a regime for sustainable transport biofuels will be a slow process that can take years of negotiations. If this approach is applied, there will possibly be a need for an over-national institution to govern and implement international policies for sustainable biofuels. The work of such an institution can be difficult to organize.

To make the EU policy for sustainable transport biofuels more effective in relation to its purpose, public participation and public awareness about sustainable transport biofuels and their production methods should be increased. Relevant information about different types of transport biofuels and their influence on environment should be distributed to consumers, 106 so that they understand their preferences and choices better. Such measures are important both at the international, regional and national levels.

Summarizing reflections can be made that the EU policy for sustainable transport biofuels should rather be seen as a developing process, not as a static notion. It has its own pros and corns. On the one hand, it is ambitious, consequent and thoroughly planned. It contains a lot of interesting ideas and efficiently functioning elements, which can be borrowed for policies of a similar kind. On the other hand, there are many aspects dealing with the environmental sustainability, which remain unclear. For example, the EU policy relies much on the import of biofuels, or biomass for biofuel production, from countries outside EU, which cannot be viewed as sustainable in the long perspective. The EU policy can win more, if it encourages domestic production of sustainable transport biofuels. The EU initiatives and efforts are probably not enough to create and efficiently govern an international regime for sustainable transport biofuels.

6.2. Reflections on the Content of Directive 2009/28/EC

Directive 2009/28/EC plays the central role in the EU policy for sustainable transport biofuels. The most important aspects of its content should be discussed here.

It is explained in the Preamble of the Directive that the 2020 individual targets for the share of renewables in the final energy consumption have been determined with due regard to a fair and adequate allocation, considering the EU Member States' different starting points and potentials. 107 Much can be argued about the advantages and disadvantages of the differentiated target approach. The individual targets are more preferable environmentally, because different Member States have different conditions for the development of renewable energy. The sum of the

100 Scarlat, N., Dallemand, J. F., & Banja, M. (2013). Possible impact of 2020 bioenergy targets on European Union land use. A scenario-based assessment from national renewable energy action plans proposals, p. 599.
101 Hoogeveen, J., Faure, J.-M., van de Giessen, N. (2009), Increased Biofuel Production in the Coming Decade: to What Extent Will it Affect Global Freshwater Resources?, p. 152.
102 At present, there is no agreement on what sustainable biofuels actually are, or how they should be promoted [Di Lucia, L. (2013). Too difficult to govern? An assessment of the governability of transport biofuels in the EU. Energy Policy, p. 3].
103 This approach is regulated in Article 9 of Directive 2009/28/EC. Article 9, as has been explained in the previous Chapter, allows cooperation between the Member States and third countries on all types of joint projects. Though this regulation refers to renewable electricity production, the idea behind it can be used in the promotion of sustainable production of biofuels. Article 18.4 of Directive 2009/28/EC deals with a similar initiative. It states that EU shall endeavor to conclude bilateral or multilateral agreements with third countries containing provisions on sustainability criteria for biofuels.
104 Ebbesson, J. (1996), Compatibility of International and National Environmental Law, p. 142.
105 Similar ideas are expressed in Börjesson, P., Ericsson, K., di Lucia, L., Nilsson, L., Åhman, M. (2008), Hållbara drivmedel – finns de?; Ebbesson J. (1996), Compatibility of International and National Environmental Law, p. 32.
106 Börjesson, P., Ericsson, K., di Lucia, L., Nilsson, L., Åhman, M. (2008), Hållbara drivmedel – finns de?, p. 90.
107 Point 15, the Preamble.

appropriately set individual targets makes it easier to achieve the EU common targets. Still, the percent of renewable energy, which different Member States are to achieve by 2020, varies considerably. It is unclear what possible consequences of such a disproportionate division can be, and how this will influence the development of the EU biofuel industry. Differences in the target setting should not be so radical, perhaps, as this can lead to inadequate consequences and inconsistent effects. Another controversial aspect is whether the 10 % target of the share of renewables in the transport sector should also be differentiated, reflecting individual conditions of each Member State, and what possible effects this can have.

It can be explored whether there is a need to set binding targets for renewable sources of energy in the transport sector at all, and what strong and weak sides this can have. The binding targets provide security for investments and create stability at the market. They can also lead to the lack of flexibility with regard to new technologies and new changing conditions. My opinion is that EU needs binding targets for renewables in the transport sector, where biofuels are estimated to play a dominating role, and this is not only to create security for investments. Biofuels, if produced in a sustainable way, have the potential to contribute to the reduction of GHG emissions and, consequently, to combating climate change. Biofuels are a promising supplement to traditional fossil fuels, which at present are the main source of GHG pollution in EU.

The EU binding targets for renewable energy fulfil the function of an environmental planning, which helps to use natural resources in an efficient and rational way. Firstly, the EU binding targets stir the development of the biofuel market. Secondly, they regulate the quantity of biofuels that are produced, imported to and used in EU. The latter aspect is especially important from the environmental point of view: globally, biofuels should be produced in reasonable amounts that are sustainable for our planet and the carrying capacity of its biosphere. An unreasonable and spontaneous increase in biofuel production can lead to the use of less sustainable production methods. Gradual and well-planned increase, on the contrary, is able to facilitate the realization of the biofuel potential. 108 Thirdly, the binding targets are likely to stimulate the creation of the EU biofuel regime, with the impact on the international biofuel production.

The EU binding targets will certainly promote the use of sustainable biofuels in EU. Among the drawbacks of the binding targets, it can be mentioned that they will interfere with natural market mechanisms. A recommendation can be given that the 10 % target for renewable energy should not be eliminated. It should be probably minimized, in order to be more realistic. Research can be done whether an unsustainable fulfilment of the 10 % target can be destructive for the environment.

Another issue for consideration is that there is a need for an internationally accepted definition or explanation of how the concepts of sustainable development and sustainability are understood in relation to the production of transport biofuels. A well-formulated definition or explanation will contribute to the clarity and precision of the content of Directive 2009/28/EC, as well as rationalize the understanding of its implementation area. 109

It is doubtful whether the production of biofuels made of wastes, residues and non-food cellulosic material is enough promoted in Directive 2009/28/EC. It can be advised that the production of these types of biofuels should be encouraged more, because natural scientists see the future of the biofuel sector in the development of biofuels of this type.

Critical questions that can be raised, with the purpose to safeguard environmental protection are whether Directive 2009/28/EC functions as it has been planned, and whether it leads to the achievement of the determined environmental goals. Assessment of how the Directive prevents environmental degradation is important.

Strong and weak sides of Directive 2009/28/EC should be finally summarized. Starting with the strong sides, Directive 2009/28/EC is a positive legislative initiative in the field of environmental law. It reflects that EU pays much attention to the environmental and climate issues, as well as continues to develop environmental protection. The EU initiative is very advantageous for the global environment. Legal and political power of EU to preserve environmental interests exceeds what separate EU Member States can do in this area. EU uses this advantage efficiently, being an important environmental actor on the international political arena.

The introduction of a legal framework with sustainability criteria is a large step forward in law. It is a motivating example internationally. The Preamble of Directive 2009/28/EC plays a significant role in providing additional information and explaining the content of this legal act. For example, the importance of the issue of land use change and consequences of the biofuel production for the food market are especially stressed there. This approach can function as an example of how an efficient legal framework can be constructed, though certain structural elements in Directive 2009/28/EC should possibly be elaborated in the future, in order to protect and safeguard sustainability even more.

Directive 2009/28/EC, its 10 % binding target for the transport sector, calculation methods for its achievement, definitions of different types of biofuels, sustainability criteria for biofuels and required monitoring procedures are a good start in promoting sustainable biofuels. It can happen that international obligations are expressed in vague terms, and this creates interpretation and implementation difficulties. 110 This is not the case with Directive 2009/28/EC and the EU policy documents for sustainable transport biofuels. In the Directive, the 2020 targets for the Member States are clearly stated, and the content of the sustainability criteria is transparent. The definitions are clear

108 Börjesson, P., Ericsson, K., di Lucia, L., Nilsson, L., Åhman, M. (2008), *Hållbara drivmedel – finns de?*, p. 101.

109 Similar ideas about the importance of clear definitions have been expressed in Westerlund, S. (2003), *Miljörättsliga grundfrågor 2.0*, p. 74.

110 Ebbesson, J. (1996), *Compatibility of International and National Environmental Law*, p. 134.

and precise, though their list could be extended. The question whether the sustainability criteria are formulated clear enough for the involved actors to understand and fulfil them can be discussed further.

The analysis of the central issues in Directive 2009/28/EC in relation to the sustainable quality of transport biofuels and their production indicates that setting binding national targets is an important instrument to implement and enforce sustainability in this area. The targets indicate the level, which national energy policies shall achieve, and help to evaluate the efficiency of measures, which the Member States apply.111 The fixed timeframe for the achievement of the targets provides stability for the producing industry and gives assurance to necessary investments, which is a very positive impact.

Pointing out the weak sides of Directive 2009/28/EC, it is vague what environmental effects an increased production of biofuels, promoted by this legal act, will have. It can be argued whether there is a need to set interim sub-targets for renewable energy in the transport sector, with the purpose to simplify the achievement process for the EU Member States. In spite of the fact whether and how EU develops its policy for sustainable transport biofuels, a strong tendency is that the use of biofuels will be expanded internationally, particularly in developing countries.112 The elaboration of the sustainability criteria for biofuels should be continued, in order to promote their sustainable quality and establish a minimum level of environmental protection during their production.

7. Conclusions

In this article, the EU policy for sustainable transport biofuels, its development and main issues have been investigated. The content of the central legal frameworks in this area, including Directive 2003/30/EC, Directive 2009/30/EC and Directive 2009/28/EC have been explored. The obligations, which these documents have imposed on the EU Member States, have been considered. Special focus has been laid on the content of Directive 2009/28/EC, which takes the central place in the EU policy for sustainable transport biofuels. A number of structural elements, important for the efficient functioning of Directive 2009/28/EC, have been outlined. Among them there are the binding targets for renewable energy, which the EU Member States need to achieve; calculation methods for the binding targets; cooperation mechanisms, allowed and recommended for the achievement of the binding targets; sustainability criteria for transport biofuels, necessary for the achievement of the binding targets; and monitoring of how the requirements of Directive 2009/28/EC are fulfilled. Possibilities to establish an international regime for sustainable transport biofuels have been discussed.

Two main approaches can be distinguished in the EU policy for sustainable transport biofuels, which are the *quantity* and *quality* approaches. The quantity approach has taken the form of interim and binding targets for the EU Member States in the question of renewable energy. The quantity approach has two central goals: the reduction of GHG emissions during the production of biofuels, with the purpose to maintain their sustainable quality, and a large scale production of sustainable biofuels inside EU. The quality approach is primarily expressed as the list of the sustainability criteria for biofuels. Internationally, it is a rather new issue in law, but its importance, especially in relation to the concepts of sustainable development and environmental sustainability, cannot be underestimated. It will be interesting to research in the future, whether there might be a conflict between the quantity and quality approaches in the EU policy for sustainable transport biofuels.

Conclusions can be made that the EU policy for sustainable transport biofuels is ambitious and motivating. It can be seen as an instructive example of how the concepts of sustainable development and sustainability can be legally operationalized and implemented. Directives 2009/28/EC and 2009/30/EC, as well as earlier documents, which have formed the EU policy in this area, have been important steps forward in the development of the EU approach to sustainable transport biofuels and their sustainable production. However, the interim indicative target for 2005 in Directive 2003/30/EC was not achieved by the majority of the EU Member States. It is questionable to what extent the binding 2020 targets from Directive 2009/28/EC will be achieved. The challenge is now to move from policy design to the implementation and enforcement of the requirements of Directive 2009/28/EC at the national level, with concrete actions on the ground.113 If this is done successfully, Directive 2009/28/EC has the potential to become one of the most efficient legal frameworks on renewable energy in the world.114

The EU policy for sustainable transport biofuels should be viewed as work in progress. There are many aspects that can be improved and/or made better organized. Preliminary, the set of the sustainability criteria for biofuels and control mechanisms for their fulfillment should be developed further. For example, criteria that regulate sustainable use of water and a tolerable use of fertilizes can be included.

Judging from the example of Directive 2009/28/EC, it can be summarized that a legal framework with binding environmental targets and mechanisms for their achievement should not necessarily be a goal of itself. It can be a part in the package of policy measures and instruments used to promote and safeguard environmental sustainability.

111 Lucia, D., L., Nilsson, L., J. (2007), *Transport biofuels in the European Union: The state of play*, p. 535.
112 Börjesson, P., Ericsson, K., di Lucia, L., Nilsson, L., Åhman, M. (2008), Hållbara drivmedel – finns de?, p. 9.
113 COM (2011) 31 final, Renewable Energy: Progressing towards the 2020 target, p. 14.
114 The European Solar Thermal Industry Federation (2013), RES Directive; SEC (2011) 129 final, Report on the operation of the mass balance verification method for the biofuels and bioliquids sustainability scheme in accordance with Article 18(2) of Directive, p. 2.

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LEGAL ANALYSIS OF THE EUROPEAN UNION SUSTAINABILITY CRITERIA FOR BIOFUELS

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ABSTRACT

This paper provides a legal analysis and review of the European Union (EU) sustainability criteria for biofuels, presented in Directive 2009/28/EC. The paper discusses the EU sustainability criteria as a tool that could be efficiently utilized to operationalize and implement the concepts of sustainable development and sustainability in an industrial setting.

The results of the analysis highlight that to safeguard the sustainable quality of biofuels and their production, the list of the EU sustainability criteria should be elaborated further. Other criteria that regulate various aspects of environmental, social and economic sustainability need be added. For example, there is a need for further elaboration of the sustainable agricultural practices and tolerable use of water resources. Furthermore, as long as the EU requirements to fulfill the sustainability criteria have global impacts, the perspective of the involved actors from other regions and countries should be taken into account. Practical possibilities of the involved actors, their costs for the implementation of the sustainability criteria and regional differences should also be considered.

More generally, the paper suggests that the list of sustainability criteria, incorporated in a legal framework, should neither be too long, nor too short. A long list is not easy to implement. For a short list, as illustrated by the EU, it could be difficult to guarantee sustainability. Consequently, to the extent possible, the legislated list of sustainability criteria should be complemented by non-binding recommendations, explanations and guidelines. Furthermore, before making the suggested sustainability criteria legally binding, possible conflicts between different interests and contradictions with the already existing regulations from neighboring spheres of law should be investigated as a matter of necessity.

Keywords: Sustainability, Sustainability criteria, Biofuels, Directive 2009/28/EC.

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1. INTRODUCTION

In the energy sector, the EU has developed an ambitious policy[1] to increase the share of renewable energy in its final energy consumption to 20 per cent by 2020.[2] The policy includes a 10 per cent binding target for the use of renewable energy in the transport sector for each EU Member State.[3] Renewable energy could come from a variety of sources, but for the transport sector the main source is biofuels.[4] The central legal framework, which contains regulations in this area, is Directive 2009/28/EC.

It has thus been suggested to partially replace traditional fossil fuels with biofuels in the transport sector. This has been viewed as a promising solution to difficulties connected with the extraction and supply of oil, as well as for the reduction of GHG emissions. With time, it has become understandable that the quality of biofuels and their production methods need to be sustainable.[5] The material, from which biofuels are produced, for example energy crops of an agricultural origin, should follow certain sustainability standards. Regulating these issues with the help of sustainability criteria and introducing a legal framework aimed to support the fulfillment of these criteria has been suggested by the EU policy-makers as a possible strategy to minimize environmental damage and promote sustainability in the transport sector.

1 S Boeters, J Koornneef, "Supply of Renewable Energy Sources and the Cost of EU Climate Policy" (2011) 33 (5) Energy Economics 1024.

2 The EU's dependence on energy imports is estimated around 53 % and is expected to rise reaching 70 % by 2020. This is especially true for oil and gas consumption, which will increasingly come from sources at greater distances from EU, with possible geopolitical risks, in AN Menegaki, "Growth and Renewable Energy in Europe: A Random Effect Model with Evidence for Neutrality Hypothesis" (2011) 33 (2) Energy Economics 257.

3 C Egenhofer, M Alessi, *EU Policy on Climate Change Mitigation since Copenhagen and the Economic Crisis* (CEPS Working Document No. 380, 5 March 2013) 2; M Schut, C Leeuwis, A van Paassen, *Ex Ante Scale Dynamics Analysis in the Policy Debate on Sustainable Biofuels in Mozambique* (2013) 18 (1) Ecology and Society 3.

4 H Pacini, L Assunção, J van Dam, JrR Toneto, *The price for biofuels sustainability* (Energy Policy, 59, August 2013) 900; the alternative and complementary approach to biofuels can be the use of electric cars charged on electricity from renewable sources, though the share of this type of cars is expected to be modest in the near future, in A Lendle, M Schaus, *Sustainability Criteria in the EU Renewable Energy Directive: Consistent with WTO Rules?* (an ICTSD Project on WTO Jurisprudence and Sustainable Development, ICTSD information note No. 2, September 2010) 1; with respect to the promotion of biofuels, EU pursues four main goals: to fulfill the climate change commitments of the Kyoto Protocol and its follow-up agreements; to reduce the dependency on mineral oil imports; to strengthen the agricultural sector; and to facilitate the development of rural areas. The first three goals are especially highlighted in P Buschmann, *The EU Renewable Energy Directive 2009/28/EC and its Sustainability Criteria - An Effective Approach to Alleviate Climate Change? The Case of Indonesian Palm Oil* (WWU Münster, UT Enschede 2011) 12.

5 S Schlegel, T Kaphengst, *European Union Policy on Bioenergy and the Role of Sustainability Criteria and Certification Systems* (2007) 5 (2) Journal of Agricultural and Food Industrial Organization 11.

Among the mechanisms and operational elements to achieve the 20 per cent and 10 per cent binding targets for renewable energy in Directive 2009/28/EC includes calculation methodology for the binding targets, co-operation mechanisms for the achievement of the binding targets, sustainability criteria for biofuels, mechanisms to control the fulfillment of the sustainability criteria, and monitoring procedures for providing transparency and information. Within this framework, the EU sustainability criteria for biofuels can be seen as a tool for promoting and safeguarding sustainable development and sustainability in the energy sector.

Other prominent institutional frameworks for sustainable biofuels that could be compared with the EU approach, are the Dutch Cramer Criteria, the UK Renewable Transport Fuels Obligation (RTFO), and Version 0 of the Global Principles and Criteria for Sustainable Biofuels Production, created by the Roundtable on Sustainable Biofuels (RSB).[6] Arguably, the EU sustainability criteria for biofuels are not the same as the Dutch criteria, and the Dutch framework is not the same as the UK framework, although they have been developed at the same level of the administrative scale.[7]

The objective of this article is to add to the understanding of how sustainability criteria can be used in a legal context as a tool to promote, implement and safeguard sustainability in an industrial sector. The central research questions are: What are potentially strong versus weak sides of the EU approach to the sustainability criteria? and What general suggestions for the future development of this approach can be made? The objective is achieved through the analysis of different traits and features of the EU approach to the sustainability criteria for biofuels. The technical side of what makes the production of biofuels sustainable is left aside, including the question whether the EU sustainability criteria hinder the production of sustainable biofuels from the point of view of natural science. It is not considered the task of law to investigate this issue.

This article consists of six sections, this introduction being the first. In the second section, the content of the EU sustainability criteria for biofuels from Directive 2009/28/EC is examined. The third section considers the development of the EU approach to the sustainability criteria after Directive 2009/28/EC. Following this, the fourth section contains an analysis of the EU sustainability criteria for biofuels. Strong and weak sides of the EU approach

6 M Schut, C Leeuwis, A van Paassen, *Ex Ante Scale Dynamics Analysis in the Policy Debate on Sustainable Biofuels in Mozambique* (2013) 18 (1) Ecology and Society 5.
7 Ibid. 9.

are highlighted and discussed. In the fifth section, suggestions for the future development of the EU sustainability criteria are discussed. Finally, generalizing reflections and conclusions on the research topic are provided in the last section.

2. THE EU SUSTAINABILITY CRITERIA FOR BIOFUELS IN DIRECTIVE 2009/28/EC[8]

The core regulations on the sustainability criteria for biofuels[9] and their implementation can be found in Articles 17, 18 and 19 of Directive 2009/28/EC. Article 17 consists of nine paragraphs and dwells upon the material content of the legislated sustainability criteria. Article 18 "Verification of compliance with the sustainability criteria" sets the requirements to control the fulfillment of the sustainability criteria. Article 19 explains the methodology for the calculation of the GHG impacts of biofuels.

The sustainability criteria in Article 17 can be divided into two main groups, according to their content and purpose. They are the requirements (a) on the GHG emission savings from the use of biofuels in comparison to the traditional fossil fuels,[10] and (b) on the land use during the production of energy crops for biofuels.[11] To fulfill the sustainability criterion on the GHG emission savings, the reduction of GHG emissions generated through the use of a specific biofuel instead of a traditional fossil fuel has to be above a certain threshold.[12] A minimum savings rate of 35 per cent applied from the very beginning. For installations that were in operation before 23 January

8 The list of the sustainability criteria for biofuels from Directive 2009/28/EC is almost identically repeated in Directive 2009/30/EC.

9 The sustainability criteria in Directive 2009/28/EC apply not only for liquid and gaseous biofuels, but also to bioliquids used for other energy purposes than transport; for further commentaries see A Lendle, M Schaus, *Sustainability Criteria in the EU Renewable Energy Directive: Consistent with WTO Rules?* (an ICTSD Project on WTO Jurisprudence and Sustainable Development, ICTSD information note No. 2, September 2010) 2; there are expectations that these criteria may be extended to include solid biofuels in the future, V Schueler, U Weddige, T Beringer, L Gamba, P Lamers, *Global Biomass Potentials under Sustainability Restrictions Defined by the European Renewable Energy Directive 2009/28/EC* (GCB Bioenergy, 5, 6 2013) 1.

10 Article 17.2.

11 Article 17.3 – 17.5; A Uslu, J Stralen, B Elbersen, C Panoutsou, U Fritsche, H Böttcher, *Bioenergy scenarios that contribute to a sustainable energy future in the EU27* (Biofuels, Bioproducts and Biorefining, 7, 2, 164-172 2013) 166.

12 Article 17.2; the calculation of life cycle emissions of GHGs includes carbon dioxide (CO2) of fossil origin, methane (CH4) and nitrous oxide (N2O); for more information on this issue see the research of LM Tufvesson, M Lantz, P Börjesson, *Environmental performance of biogas produced from industrial residues including competition with animal feed–life-cycle calculations according to different methodologies and standards* (Journal of Cleaner Production, vol. 53 2013) 215.

2008, a grace period was introduced, which expired on 1 April 2013. From 2017, all biofuels will have to fulfill a 50 per cent threshold, and from 2018 the threshold will increase to 60 per cent.[13] The requirement in the last sentence is relevant for installations that will start operating in 2017 or later.

Article 17.3 – 17.5 of Directive 2009/28/EC specifies the three sustainability criteria for land use, naming the types of land from which energy crops for biofuels shall not originate. Lands with high biodiversity values are protected under Article 17.3, lands with high carbon stocks are protected under Article 17.4, and peatlands – under Article 17.5. More exact, biofuels shall not be produced from raw materials obtained from land with high biodiversity value, which includes primary forest and other wooded land, areas designated for nature protection or the protection of rare, threatened or endangered ecosystems or species, and highly bio-diverse grasslands. Secondly, biofuels shall not be made from raw materials obtained from land with high carbon stock, namely wetlands, continuously forested areas, or land spanning more than one hectare with a certain minimum canopy cover. Thirdly, biofuels shall not be made from raw material obtained from peatland, unless evidence is provided that the cultivation and harvesting of that raw material does not involve drainage of previously undrained soil. These sustainability criteria are to be based on the status of land in January 2008.

Biofuels produced from waste and residues, e.g. other than agricultural and forestry residues, need only fulfill the GHG emission savings sustainability criterion, which is formulated in Article 17.2.[14] This limitation can be explained by the fact that the other sustainability criteria in Directive 2009/28/EC, which deal with the land-use requirements, are not relevant for the production of biofuels of this type.

The sustainability criteria in Article 17 are the same in all the EU Member States. They must be fulfilled cumulatively, and are applied equally to the EU produced and imported biofuels.[15] This implies that biofuels can be imported into EU, even if they do not meet the sustainability criteria, and a parallel market of unsustainable biofuels can be established. However, biofuels must comply with the sustainability criteria, in order to be counted towards the mandatory 2020 renewable energy targets and to be eligible

13 EM Basse, *Environmental Reviews and Case Studies: The Legal Design of Sustainability Criteria on Biofuels Used by the European Union* (Environmental Practice, 1-12 2013) 4.
14 Article 17.1.
15 This idea is particularly highlighted in COM (2008) 30, *20 20 by 2020 Europe's Climate Change Opportunity*; S Afionis, LC Stringer, "The European Union Leadership in Biofuels Regulation: Europe as a Normative Power?" (2012) 32 Journal of Cleaner Production pp. 114 – 123.

for financial support,[16] e.g. in the form of governmental subsidies. Biofuels produced from waste count double towards the 2020 targets.[17]

The Member States have no right to impose stricter sustainability criteria than those expressed in Directive 2009/28/EC.[18] In the related EU policy documents, it was emphasized that the EU approach to the sustainability criteria aims for a complete harmonization of the biofuel sustainability criteria in EU, with the purpose to ensure that no criteria adopted individually by the Member States may constitute an obstacle to trade.[19]

3. DEVELOPMENTS AFTER DIRECTIVE 2009/28/EC

Since Directive 2009/28/EC came into force, the EU Commission has adopted a number of Decisions and Communications with the purpose of commenting on the content of the sustainability criteria for biofuels and to guide their implementation.[20] In October 2012, EU proposed changes to its policy for sustainable transport biofuels.[21] It was promoted to minimize the climate impact of biofuels through limiting the use of biofuels of an agricultural origin,[22] which can be counted towards the 10 per cent target for renewable energy in the transport sector by 2020, to the consumption level of 5 per cent.[23] Among other important aspects, such as to minimize the GHG emissions during the production of biofuels and the impact of the

16 Article 17.1.

17 Article 21.2; Energy Community, *New Details: Secretariat holds a Workshop on the Implementation of the RES Directive 2009/28/EC* (25-04-2013); the EU regulations do not prohibit trade of non-sustainable biofuels, see EM Basse, *Environmental Reviews and Case Studies: The Legal Design of Sustainability Criteria on Biofuels Used by the European Union* (2013) 1 Environmental Practice, 1-12.

18 This is due to the fact that the sustainability criteria were adopted according to Article 95 of the EC Treaty. Today this provision corresponds to Article 114 in the Treaty on the Functioning of the European Union (C 326/47, OJ C 326, 26.10.2012), which contained the EU internal market regulations.

19 COM (2008) 0019, *Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources*.

20 As an example, a policy package from 2010 can be named. It consists of Communication (2010/C 160/01) on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme, Communication (2010/C 160/02) on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels, and Decision C(2010) 3751 on guidelines for the calculation of land carbon stocks.

21 COM (2012) 595 final, *Proposal for a Directive of the European Parliament and of the Council amending Directive 98/70/EC relating to the quality of petrol and diesel fuels and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources*.

22 This includes biofuels and bioliquids produced from cereal and other starch rich crops, sugars and oil crops, see COM (2012) 595 final, 14.

23 Ibid.; H Pacini, L Assunção, J van Dam, JrR Toneto, *The Price for Biofuels Sustainability* (Energy Policy, 59, August 2013) 902.

indirect land-use changes, the EU Commission underlined that the primary objectives of Directive 2009/28/EC are the protection of the environment and the functioning of the internal market.[24]

There is an opinion that though the EU proposal of 2012 fosters technological development and seeks to avoid putting pressure on such significant sustainability issues as the health of the environment and food production, it constrains the situation for producers who have invested in the production and certification of sustainable biofuels of an agricultural origin.[25]

4. ANALYSIS OF THE EU SUSTAINABILITY CRITERIA FOR BIOFUELS

The EU sustainability criteria create a substantial demand for produced biofuels in the EU Member States and in other parts of the world. They add to setting an international trend for this production branch.[26] There have been many discussions on the material content and choice of the EU sustainability criteria by experts and scientists from different fields. Calls have been made for sustainability criteria, consistent with and relevant for the agricultural sector in general.[27] The purpose of this section is to analyze the EU sustainability criteria for biofuels from a legal perspective, as well as to highlight and research their potentially strong and weak sides.

4.1 Strong Sides of the EU Approach to the Sustainability Criteria

The EU approach to sustainable biofuels is based on a legal framework with a limited number of sustainability criteria, which address urgent environmental concerns. It is an important judicial initiative internationally. It is a step forward in gaining experience on how to promote, protect and control environmentally sustainable products and their production. The established sustainability criteria create a link between the concepts of sustainable development and sustainability and their practical implementation in an industrial branch. To a certain extent, the sustainability criteria for biofuels ensure that this industry will develop in an environmentally sustainable way in the foreseeable future.

24 COM (2012) 595 final, 5.
25 H Pacini, L Assunção, J van Dam, JrR Toneto, *The Price for Biofuels Sustainability*, op.cit at 902.
26 Biomass Technology Group, BTG, *Sustainability Criteria & Certification Systems for Biomass Production* (final report, project No. 1386, the Netherlands 2008) 89.
27 T Howes, *Directive 2009/28/EC* (Institute for European Studies, Brussels University Press 2010) 141.

Directive 2009/28/EC constitutes the central legal act in this area. It provides an explicit and well-established connection between the environmental goal of the EU policy for biofuels, presented in the form of the 2020 binding targets for renewable energy, and the list of the sustainability criteria, which function as an operational tool to achieve this goal. This connection seems to be productive and fulfills its purpose: the 2020 binding targets provide an important incitement to follow the sustainability criteria.

The content of the sustainability criteria is clearly formulated. They are not dubious or elusive. The strict minimum threshold for GHG emission savings and the land-use requirements, which the sustainability criteria set, are grounded in detailed and encompassing scientific data. Articles 18 and 19 contain explicit requirements on how the fulfillment of the sustainability criteria is to be controlled. Some researchers point out that the EU approach contains strong control mechanisms, which demand the EU Commission and the Member States to report on measures taken to respect the sustainability criteria and their impact on additional sustainability issues, such as the increased pressure on food security, developmental tendencies in countries outside EU, respect of land-use rights and protection of air, soil, water and biodiversity.[28] These control mechanisms make the EU approach responsive to aspects that need further elaboration. They create a solid platform for the reconsideration of the achieved results and an ongoing evaluation.

4.2 Weak Sides of the EU Approach to the Sustainability Criteria

There are a number of weak sides in the EU approach to the sustainability criteria for biofuels, which should be thoroughly considered. To start with, the list of the EU sustainability criteria and the issues that they address are not enough to guarantee the sustainable quality and sustainable production of biofuels.[29] This is the problem that needs to be addressed in the future. Large-scale biofuel production can cause soil and water degradation, as well as air pollution.[30] The regulation of these issues is left outside the scope of the EU sustainability criteria. Directive 2009/28/EC merely requests research and evaluation of these questions.[31] Even other more specific aspects of environmental protection can

28 P Buschmann, *The EU Renewable Energy Directive 2009/28/EC and its Sustainability Criteria - An Effective Approach to Alleviate Climate Change? The Case of Indonesian Palm Oil* (WWU Münster, UT Enschede 2011) 34.

29 P Börjesson, K Ericsson, L di Lucia, L Nilsson, M Åhman, *Hållbara drivmedel – finns de?* (rapport N. 66, November 2008, Lund University, Sweden 2008) 92.

30 S Afionis, LC Stringer, "The European Union Leadership in Biofuels Regulation: Europe as a Normative Power?" (2012) 32 Journal of Cleaner Production 114 – 123.

31 Article 18.9.b.

be added to the list of the sustainability criteria for biofuels. As an example, impacts on the function of soil and soil fertility, effects on water quality and water supply, an environmentally sound use of fertilizers and pesticides, and the reduction of the emissions that cause acidification, eutrophication and ozone destruction can be named.[32] Enclosure of these aspects into the EU list of the sustainability criteria needs to be discussed.

Generally formulated sustainability criteria, as in the EU policy for biofuels, do not reflect regional special traits and features, such as variations in climate, soil quality, infrastructure and economic development. However, these variations can cause differences in production processes, which can result in difficulties in the implementation of the sustainability criteria and assessment of their fulfillment. On the contrary, a law that is very much detailed has a risk to quickly become out of date, and, as a consequence, contra-productive to its environmental goal.[33] An often changing legal framework is not able to create stability and certainty.

There is an explanation that EU has chosen not to make a more detailed list of the sustainability criteria, because it would be unable to justify trade-distorting measures of this kind to the WTO.[34] As a result, these issues were merely included in reporting and monitoring requirements for the Member States.[35] It can be speculated that only a limited number of binding sustainability criteria would hold ground in case of a potential WTO conflict. Future legal development will show to what extent the EU sustainability criteria for biofuels are compatible with the WTO regulations. Probably, the WTO would legally accept the right of its members to set restrictions of an environmental character for imported products. Such a decision would answer the environmental demands of our planet.

Among the important environmental concerns, which have not been addressed by the EU sustainability criteria, there is the issue of the indirect land-use change (iLUC) caused by the biofuel production.[36] This has been

32 B Eickhout, GJ van den Born, J Notenboom, M van Oorschot, JPM Ros, DP van Vuuren, HJ Westhoek, *Local and global consequences of the EU renewable directive for biofuels. Testing the sustainability criteria* (A report of the Netherlands Environmental Assessment Agency 2008) 23.

33 This idea is expressed in S Westerlund, *Miljörättsliga grundfrågor 2.0* (Institutet för miljörätt, IMIR, Björklinge 2003) 98.

34 EB Lydgate (2012), *Biofuels, sustainability, and trade-related regulatory Chill* (2012) Journal of International Economic Law, 15, pp. 1–24 2012) 160.

35 S Afionis, LC Stringer, op.cit at 118.

36 A Uslu, J Stralen, B Elbersen, C Panoutsou, U Fritsche, H Böttcher, *Bioenergy scenarios that contribute to a sustainable energy future in the EU27* (Biofuels, Bioproducts and Biorefining, 7, 2, 164-172 2013) 167.

considered as a very significant weakness of the EU approach to the sustainability criteria,[37] because iLUC has a decisive impact on the environmental sustainability and viability of biofuels. It bears the potential to reduce the contribution of biofuels to the achievement of the 2020 targets for renewable energy. In addition, iLUC can have long-lasting negative environmental effects on soil, water and air quality, as well as on biodiversity.[38]

Estimating the GHG impact due to iLUC is rather complex.[39] Some researchers have perceived potential sustainability criteria on iLUC as "too ambitious," and have argued that they could "scare away investors".[40] Other analyses have shown that it is a problem that iLUC is actually not included in the EU sustainability criteria that deal with the calculation of GHG emissions and biodiversity consequences. Farming of energy crops for biofuel production is displacing current agricultural food and feed production, as well as production of forest-related products, such as fiber and timber, to other areas, which leads to iLUC effects. There is also a risk that this displacement can move previous agricultural production to areas outside of a country, making it very complicated to estimate the consequences.[41]

There are still other uncertainties regarding the development of the EU sustainability criteria.[42] Some studies have analyzed effects of an increased biofuel production on GHG emissions and land-use change (LUC) in global general and partial models.[43] The results suggest that in addition to biofuel-specific sustainability criteria, strict land-use policies should be established to reduce GHG emissions and the loss of biodiversity and habitats.[44]

37 P Buschmann, *The EU Renewable Energy Directive 2009/28/EC and its Sustainability Criteria - An Effective Approach to Alleviate Climate Change? The Case of Indonesian Palm Oil* (WWU Münster, UT Enschede 2011) 35.

38 Ibid.

39 A Uslu, J Stralen, B Elbersen, C Panoutsou, U Fritsche, H Böttcher, *Bioenergy scenarios that contribute to a sustainable energy future in the EU27* (Biofuels, Bioproducts and Biorefining, 7, 2, 164-172 2013) 167.

40 M Schut, C Leeuwis, A van Paassen, *Ex Ante Scale Dynamics Analysis in the Policy Debate on Sustainable Biofuels in Mozambique* (Ecology and Society, 18, 1 2013) 3.

41 EM Basse, *Environmental Reviews and Case Studies: The Legal Design of Sustainability Criteria on Biofuels Used by the European Union* (2013) Environmental Practice 9.

42 J Fabeny, J Romero, D Ross, *Synthesizing the Biofuel Policies of Europe* (the Elliott School of International Affairs 2008) 32; EM Basse, ibid at 8.

43 See for example the research of P Havlík, UA Schneider, E Schmid, B Böttcher, S Fritz, S Skalský et al., *Global land-use implications of first and second generation biofuel targets* (Energy Policy 39:5690–5702 2011) and A Popp, M Krause, JP Dietrich, H Lotze-Campen, M Leimbach, T Beringer, N Bauer, *Additional CO2 emissions from land use change — Forest conservation as a precondition for sustainable production of second generation bioenergy* (Ecological Economics, 74, 64-70 2012).

44 H Böttcher, S Frank, P Havlík, B Elbersen, *Future GHG emissions more efficiently controlled by land use policies than by bioenergy sustainability criteria* (Biofuels, Bioproducts and Biorefining 2013) 116.

There is a point of view that land-use policies and the involved planning and monitoring of land use should be sustainable. They should target sustainability irrespectively of how the land is aimed to be used and what types of crops will possibly be farmed there.[45] It has been suggested that these issues need to be addressed more directly, focusing on knowledge and understanding of local situations. High-quality scientific guidance is important.[46]

A number of researchers argue that the potential effects of the EU policy for biofuels on global land use with negative implications on GHG emissions cannot be regulated through the sustainability criteria only.[47] Other efficient tools and policies should be added, for example targeting GHG emissions from deforestation and biodiversity loss at a more global level. Böttcher et al. (2013) means that the challenge of sustainable biofuel supply is to avoid a leakage of biomass production for biofuels to neighboring sectors not covered by the sustainability criteria, for example, timber, food and feed sectors.[48]

Another weak side of the EU approach to the sustainability criteria for biofuels is in its methodology for calculating GHG emissions. The current calculation method presented in Article 19 of Directive 2009/28/EC has a limited perspective. For example, the actual utilization of industrial residues is not included in the calculations.[49] Possibly, the guidelines of the Commissions for calculating GHG emissions, especially GHG emissions caused by land use changes need to be revised to make sure no misleading incentives for conversion of grasslands and forests to oil palm plantations are given.[50]

An opinion has been expressed that EU has not framed its policy for sustainable biofuels in light of possible developmental trends and impacts on other regions and countries that would be involved in the biofuel pro-

45 N Scarlat, J-F Dallemand, *Recent developments of biofuels/bioenergy sustainability certification: A global overview* (Energy Policy, March 2011, vol. 39, issue 3, pp. 1630-1646 2010) 1645.

46 H Böttcher, S Frank, P Havlík, B Elbersen, op.cit at 123.

47 Ibid.

48 Ibid.

49 LM Tufvesson, M Lantz, P Börjesson, *Environmental performance of biogas produced from industrial residues including competition with animal feed–life-cycle calculations according to different methodologies and standards* (2013) 53 Journal of Cleaner Production 221.

50 AM Hennecke, M Faist, J Reinhardt, V Junquera, J Neeft, H Fehrenbach, *Biofuel greenhouse gas calculations under the European Renewable Energy Directive–A comparison of the BioGrace tool vs. the tool of the Roundtable on Sustainable Biofuels*, (Applied Energy, 102, 55-62 2013) 61.

duction, for example for Africa[51] and Indonesia.[52] The recent analysis of the specific case of Indonesian palm oil stresses that the EU sustainability criteria do not adequately consider the impact of its measures on third countries like Indonesia, although the EU 2020 targets are not likely to be achieved without their contribution.[53] Extensive consultations with the biofuel producing countries outside the EU can be recommended.[54] Possibly, the Clean Development Mechanism (CDM) could serve as a model that shows how biofuel-exporting countries could become involved. The previous experience indicates that it would take a considerable effort to develop sustainability criteria or a sustainability standard for a single type of biofuel.[55]

It has not come out from the EU policy documents to what extent costs for the fulfillment of the EU sustainability criteria and proving compliance with them, which is the responsibility of the involved producers, have been taken into account by the EU policy-makers. Pacini et al. (2013) distinguishes between direct and indirect costs for producers. Direct costs, according to this research group, include certification fees, information costs, costs for changes to management systems and auditing fees. Indirect costs consist of internal adaptation costs.[56] Pacini et al. warns that both the direct and indirect costs can be high. This can become a problem for producers in less favored regions.[57]

Caution has been expressed that biofuels that fulfill the EU sustainability criteria will comprise a small higher price segment, while the uncertified products will probably supply the rest of the market.[58] This can mean that in spite of the legislated sustainability criteria, the issue of the sustainable quality of biofuels and their sustainable production would not be resolved.

Taking the perspective of the involved actors into account, as well as their practical knowledge and possibilities, it should be mentioned that the scope of the EU sustainability criteria, and especially the calculation meth-

51 M Schut, C Leeuwis, A van Paassen, *Ex Ante Scale Dynamics Analysis in the Policy Debate on Sustainable Biofuels in Mozambique* (Ecology and Society, 18, 1 2013) 3.
52 P Buschmann, *The EU Renewable Energy Directive 2009/28/EC and its Sustainability Criteria - An Effective Approach to Alleviate Climate Change? The Case of Indonesian Palm Oil* (WWU Münster, UT Enschede 2011) 35.
53 Ibid.
54 Biomass Technology Group, BTG, *Sustainability Criteria & Certification Systems for Biomass Production* (final report, project No. 1386, the Netherlands 2008) 93.
55 Ibid.
56 For further information see H Pacini, L Assunção, J van Dam, JrR Toneto, *The price for biofuels sustainability* (Energy Policy, 59, August 2013) 900.
57 Ibid. 902.
58 J Lin, *The Sustainability of Biofuels: Limits of the Meta-Standard Approach* (Working Paper 011, December 2010) 10; F Pelsy, *The European Commission 2008 Directive Proposal on Biofuels: A Critique* (Environment and Development Journal 2008) 131.

odology for GHG emissions, can be complicated for an ordinary producer. They can be difficult to follow. Evidently, the EU sustainability criteria for biofuels require more commentaries and explanations, for example in the form of more detailed guidelines issued in separate policy documents. Further simplifications are also needed.

Finally, a framework with sustainability criteria that lacks accompanying indicators and proper measuring and evaluation mechanisms can be hard to supervise, monitor and control. Serious enforcement and implementation difficulties can take place. The EU approach to the sustainability criteria for biofuels has many weak points in this respect. For the three EU sustainability criteria for land use, indicators and measuring and evaluation mechanisms are not thoroughly developed. For some issues of land use there are scientific data gaps.

5. SUGGESTIONS FOR THE FUTURE DEVELOPMENT OF THE EU APPROACH TO THE SUSTAINABILITY CRITERIA

The whole EU framework for transport biofuels is under development and constant improvement. The EU sustainability criteria should be regarded as a minimum list of criteria, which function to ensure rational GHG emission savings and avoid major environmental impacts on land use and biodiversity. They create a substantial demand for sustainably produced biofuels in the EU Member States and have influence on the international consumption of biofuels.[59] It can be recommended to continue with the development of the EU legally binding sustainability criteria. This will create favorable conditions for the market to develop completing voluntary sustainability standards.

Subsequent elaborations in the list of the EU sustainability criteria can be aimed to expand it and integrate other aspects, relevant for sustainable biofuel production. To my mind, Directive 2009/28/EC has included the sustainability criteria for biofuels in a very limited number, and they all are of an environmental character. Socio-economic criteria have got almost no development. Further development of the sustainability criteria and sustainability principles for biofuels that deal with environmental, social and economic aspects of biofuel production, as well as their incorporation in the EU legal acts are required. Costs for this can be substantial, going up

59 Biomass Technology Group, BTG, *Sustainability Criteria & Certification Systems for Biomass Production* (Final Report, project No. 1386, the Netherlands 2008) xii.

to additional 8 – 65 per cent. The expenses will be strongly related to the operational scale, the strictness of the proposed sustainability criteria, their number and the expertise required to check their fulfillment adequately.[60]

To make the content and purpose of the EU sustainability criteria more precise, clear definitions of what sustainable biofuels and sustainable production of biofuels are, need to be added in the EU approach. These definitions can later serve as harmonizing descriptions or assessment indicators in relation to the sustainability criteria and environmental goals of the legal framework, in which they are included.

Amendments to the EU policy for biofuels are likely in the future. Particularly, they can improve the assessment of the impacts, which the sustainability criteria have. They can address unwanted iLUC effects of energy crops farming and better protect high bio-diverse grasslands.[61] Some researchers see the inclusion of iLUC effects in legislation and tools for their control and monitoring as an important task for future work.[62] There is advice to improve approaches for data collection, control and monitoring regarding all types of the sustainability criteria, as well as to develop central data banks, which could be used to share knowledge and competence across regions and existing sustainability requirements.[63] It should be taken into account that different types of biofuels and different production processes require different sustainability criteria.[64] Consequently, they need different indicators and measuring instruments.

More generally, the EU policy for biofuels should include a comprehensive approach that integrates energy efficiency, energy sufficiency, the reduction of GHG emissions and various aspects of environmental protection. The reduction of GHG emissions can be achieved e.g. through introducing an international regime with a price setting for GHG emissions. There are anticipations

60 J van Dam, M Junginger, A Faaij, I Jürgens, G Best, U Fritsche, *Overview of recent developments in sustainable biomass certification* (Biomass and Bioenergy, 32(8), 749-780 2008) 770.

61 V Schueler, U Weddige, T Beringer, L Gamba, P Lamers, *Global biomass potentials under sustainability restrictions defined by the European Renewable Energy Directive 2009/28/EC* (GCB Bioenergy, 5, 6 2013) 9.

62 AM Hennecke, M Faist, J Reinhardt, V Junquera, J Neeft, H Fehrenbach, *Biofuel greenhouse gas calculations under the European Renewable Energy Directive – A comparison of the BioGrace tool vs. the tool of the Roundtable on Sustainable Biofuels* (Applied Energy, 102, 55-62 2013) 61.

63 K Matus, *Assessing Challenges for Implementation of Biofuels Sustainability Criteria* (Inter-American Development Bank and United Nations Environment Program, Seminar on Assessing the Challenges for Implementation of Biofuels Sustainability Criteria, 25 – 26th January, 2010 - IDB Washington DC, IDB, UNEP 2010) 15 – 16.

64 N Scarlat, J-F Dallemand, *Recent developments of biofuels/bioenergy sustainability certification: A global overview* (Energy Policy, March 2011, vol. 39, issue 3, pp. 1630-1646 2010) 1643.

that such an approach can slow down the biofuel boom and help avoid environmental misuse.[65] Among the primary aims of the EU policy development can be to strengthen the environmental advantages of this source of energy and substantially reduce the production of unsustainable biofuels. An analysis of the existing frameworks with sustainability criteria for biofuels and similar products can provide information about the direction of the development.[66]

EU, on the basis of its approach to biofuels, has the potential to push forward and guide international work at sustainable development and sustainability in this sector, with a special influence issues such as:

a) harmonization between the existing legal frameworks and voluntary sustainability standards for biofuels, in order to avoid overlapping regulations and double work, which can lead to counterproductive results;

b) equal conditions for producers, suppliers, distributors and other involved actors, so that they follow approximately the same sustainability criteria; and

c) minimizing the number of States that do not recognize or follow sustainability criteria.[67]

An opinion has been expressed that no distinction should be made between biofuels produced within and outside EU. The introduction of the EU minimum list of the sustainability criteria in Directive 2009/28/EC can motivate the involved actors to develop voluntary sustainability standards and additional sustainability criteria, with the purpose to verify their biofuel production according to the EU requirements.[68] The role of developing countries and other involved actors at different levels should not be underestimated in this process. Researchers from Mozambique have pointed out that the debate on biofuels should be of an international character. They have expressed an expectation that the EU policy-makers would reflect the needs of major biofuel markets outside EU.[69]

65 F Ekardt, H von Bredow, *Managing the Ecological and Social Ambivalences of Bioenergy: Sustainability Criteria Versus Extended Carbon Markets* (the Economic, Social and Political Elements of Climate Change, Climate Change Management, ed. W Filho, part 3, chapter 29, pp. 455-480 2011) 476.

66 Biomass Technology Group, BTG, *Sustainability Criteria & Certification Systems for Biomass Production* (Final Report, Project No. 1386, The Netherlands 2008) 101.

67 Ibid. 3.

68 Ibid. 91.

69 M Schut, C Leeuwis, A van Paassen, *Ex Ante Scale Dynamics Analysis in the Policy Debate on Sustainable Biofuels in Mozambique* (Ecology and Society, 18, 1 2013) 8.

Many over-governmental institutions and NGOs are currently formulating their viewpoints on how to regulate biofuel sustainability and its production with the help of sustainability criteria. There seems to be a broad understanding that a uniform approach, with the grounds in what EU has achieved so far, would be very effective.[70] It can be advisable to proceed with the work at the EU policy for biofuels and to create necessary conditions, so that the market develops sustainability criteria and voluntary sustainability standards on its own, probably combining the minimum legally binding criteria and additional voluntary sustainability criteria. Only to make references to the EU sustainability criteria in voluntary sustainability standards can be insufficient.[71] In case it is legally possible, and if environmental risks are sufficiently low, certain types of biofuels could be excluded from being regulated with the help of sustainability criteria.

6. REFLECTIONS AND CONCLUSIONS

Recognizing that low carbon renewable energy will be an important part of any sustainable energy sector in the future, EU has introduced a comprehensive and robust legal framework with the sustainability criteria for biofuels. The EU sustainability criteria and supplementary elements for their implementation and enforcement can primarily be found in Directive 2009/28/EC.[72] This Directive has a potential to become one of the most ambitious legal frameworks with sustainability criteria in the world, if it is efficiently transposed and followed in the national laws of the Member States.[73] The EU Commission provided guidelines for the use of the sustainability criteria in June 2010.[74] The challenge is now to succeed in the implementation and enforcement at the national level, with concrete actions on the ground.[75]

70 Biomass Technology Group, BTG, *Sustainability Criteria & Certification Systems for Biomass Production* (final report, project No. 1386, the Netherlands 2008) 3.
71 Ibid. 90.
72 The list of the sustainability criteria from Directive 2009/28/EC is almost identically repeated in Directive 2009/30/EC.
73 European Solar Thermal Industry Federation, ESTIF, *RES Directive* (2013); SEC (2011) 129 final, *Report on the operation of the mass balance verification method for the biofuels and bioliquids sustainability scheme in accordance with Article 18(2) of Directive*, 2.
74 See e.g. Communication (2010/C 160/01) on voluntary schemes and default values in the EU biofuels and bioliquids sustainability scheme, and Communication (2010/C 160/02) on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels; see also COM (2011) 31 final, *Renewable Energy: Progressing towards the 2020 target*, 6.
75 COM (2011) 31 final, *Renewable Energy: Progressing towards the 2020 target*, 14.

The EU list of the sustainability criteria for biofuels can be characterized as one of the internationally strictest for this type of renewable energy. Without going too much in details, it can be pointed out that this list should be developed further, in order to safeguard the sustainable quality of biofuels and their production. Criteria that regulate sustainable use of soil and water can be added. More particularly, sustainable agricultural practices and tolerable use of fertilizes can be prescribed. The control and monitoring mechanisms of the fulfillment of the sustainability criteria could also be elaborated and incorporated in the EU framework. Clear definitions of what sustainable biofuels and sustainable production of biofuels are, need to be added.

Due to the fact that the EU policy for biofuels has global impacts, it should take into account the perspective of the involved actors from other regions and countries. Practical possibilities of the involved actors, their costs for the implementation of the sustainability criteria and regional differences should be considered. Further research on various sustainability issues concerning biofuels, possibly of an inter-disciplinary character, can be recommended. Relatively simple and detailed approaches to measure, control and assess the fulfillment of the sustainability criteria should be developed.

More general conclusions about using sustainability criteria in a legal context can be made. The experience of EU indicates that a legislated list of sustainability criteria should regulate the most important issues that answer for the sustainable quality of a product and its sustainable production. Otherwise the aim of including sustainability criteria in a legal framework is not fully achieved. The list of sustainability criteria should neither be too long, nor two short. A long list is not easy to implement. For a short list, and the EU case illustrates this, it is difficult to guarantee sustainability. To the extent possible, the legislated list of sustainability criteria should be completed by non-binding recommendations, explanations and guidelines.

Before making the suggested sustainability criteria legally binding, possible conflicts between different interests and contradictions with the already existing regulations from neighboring spheres of law should be researched. In the long run, these conflicts and contradictions can become a hinder in the implementation and enforcement of the legislated sustainability criteria.

The analysis of the EU approach to the sustainability criteria has also shown that one of the main difficulties in the implementation of sustainability criteria for an internationally traded product is how the fulfillment of these criteria is controlled. Limitations of what is sustainable versus practically

possible to control should be considered and respected. In the case of biofuels, theoretically well-built control mechanisms would fail to fulfill their function, if it is not practically possible to control each link in the biofuel production chain.

On the basis of Directive 2009/28/EC, it can be suggested that better international coordination is required to improve coherence and efficiency in the development of harmonized sustainability criteria. Setting up strategies of good practice and integrating sustainability criteria in global trading mechanisms may be other effective ways to ensure this.[76] There is a point of view, and I fully agree with it, that a legal framework with sustainability criteria or a voluntary sustainability standard should be linked to the development of advanced technology and production methods.[77]

76 J van Dam, M Junginger, A Faaij, I Jürgens, G Best, U Fritsche, "Overview of Recent Developments in Sustainable Biomass Certification" (2008) 32 (8) Biomass and Bioenergy 776.
77 Ibid.

Paper 4. Pavlovskaia, E. (2015), *Development of the EU Approach to Sustainable Biofuels after Directive 2009/28/EC*, Current Research Journal of Commerce and Management (CRJCM), vol. 1, no. 3, 2015, pp. 54 – 61

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Review Article

Development of the EU Approach to Sustainable Biofuels after Directive 2009/28/EC

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Abstract

In this article, the most important tendencies in the development of the EU approach to renewable sources of energy in the transport sector, and particularly sustainable biofuels after Directive 2009/28/EC are highlighted and reflected upon. The EU policy on renewable energy and the transport sector towards 2050 is outlined and explained. The 2014 EU policy framework for climate and energy, with the revised targets for renewable energy, and for the reduction of GHG emissions, including the development of the EU transport sector, is presented and dwelt upon. The future EU policy on sustainable biofuels in the transport sector is specified.

The position of the EU Parliament on the coming EU Directive on renewable energy, and its special attention to possible GHG emissions linked to indirect land-use changes (ILUC) are clarified. The final agreement to have a cap of 7 % on the contribution of food-based biofuels towards the achievement of the 10 % energy target in the EU transport sector by 2020 is pointed out. This innovation is aimed to minimize the risks of uncounted GHG emissions caused by ILUC.

The results of the article underline that the EU work in the energy and transport sectors after Directive 2009/28/EC remains advanced, constructive and ambitious. The EU approach, aimed at the development and promotion of renewable energy, and more sustainable and advanced types of biofuels continues. The EU sustainability criteria for biofuels in the transport sector remain an important tool in achieving this. The article additionally intends to raise interest of policy-makers, researchers and biofuel producers at different levels to the difficulties and challenges that the EU approach to renewable sources of energy and sustainable biofuels in the transport sector experiences, and to search for new efficient solutions.

1. Introduction

The EU policy on renewable sources of energy, and sustainable biofuels in the EU transport sector is constantly developing. It is one of the areas with the highest priority in EU.[1] It has significant global impacts. The EU promotion of renewable sources of energy and sustianable biofuels is important for the reduction of the EU dependence on foreign energy imports, and in meeting energy targets to combat global climate change.[2]-[7] After Directive 2009/28/EC, which set binding EU energy targets towards 2020[8]-[10], and sustainability criteria for biofuels in the EU transport sector [11], a lot of subsequent elaborations of the EU approach have taken place.

The purpose of this article is to provide an overview of the recent development of the EU policy on renewable sources of energy in the transport sector, and particularly sustainable biofuels. In this, the primary emphasis is put on the revised EU targets for renewable energy towards 2050, 2030 and 2020; the issue of GHG emissions connected to indirect land-use changes (ILUC) during the biofuel production, the approved amendments to Directive 2009/28/EC, and renewed requirements to sustainable biofuels. To achieve the purpose of the article, a broad range of relevant EU policy documents, preparatory materials, explanatory legal doctrine and periodicals were collected, analyzed and systematized.

2. The EU Policy on Renewable Energy and the Transport Sector towards 2050

In 2010, a report by the European Renewable Energy Council, EREC, with the title *"RE-thinking 2050, a 100 % Renewable Energy Vision for the European Union"* was presented. This report outlined a way of development towards 2030, and set out an ambitious vision for a 100 % renewable energy system for EU by 2050, integrating three important EU sectors – electricity, heating and cooling, and transport. It was noted in the report that the vision may be more ambitious than the level likely to be achieved in practice. [12] It was underlined that looking at the EU energy system of tomorrow can provide valuable insight into what has to be done today, in order to achieve the desired situation by 2050.[12]

A clear-cut and consistent mix of policy measures for the future work was proposed in this report. The measures comprised full implementation of Directive 2009/28/EC in all EU-27 Member States, binding renewable energy targets for 2030, liberalization of the EU energy market, and new transport solutions. [12] It was pointed out that a strong emphasis on sustainable development must be at the heart of any economic, environmental and social activity. [12]

The report stressed that the EU transport sector has much reliance and dependence on one single source of traditional fossil energy, and namely oil dependency of 98 %. [12] In this situation, biofuels are of much value to improve the security of the EU transport sector. [12] The leading principles for the EU development of bioenergy in the future should be sustainability criteria, efficiency and competitiveness. [12] International collaboration in this area is very important.[13] Elaborating a longer term research and development (R&D) program to support bioenergy beyond 2020, and looking towards 2050 should be a key parameter for the success of this source of renewable energy.[13]

It was specified in the report that sources of raw material for biomass, from which biofuels can be produced, include:

- Forests (firewood and round wood), and agriculture (rape seed, cereals, corn for biofuels, or short rotation coppices, or energy grass for heat and electricity production);
- Wood industry by-products (residues, bark, saw dust, shavings, chips, pellets, black liquor, etc.), and agricultural by-products (straw, manure, fruit wood etc.); and
- Waste streams. [12]

Bio-refineries should contribute to the sustainable processing of biomass into a range of marketable bioenergy products. They should develop over the coming years, and would play an important role in the 2050 approach of EU. [12] The report emphasized

that sustainable biomass as a source of bioenergy is limited, and much focus should be put on the strategic functions of biomass in the future energy systems, balancing power demand with fluctuating renewable sources.[13] The future of the EU transport sector should to much extent be seen in replacing the existing car fleet with electric cars. In the long perspective, vehicles powered by biofuels and electric cars would become the solution for the EU transport sector.[12]

In 2011, the EU Commission came forward with three inter-connected policy documents, aimed to provide a long term and integrated perspective on climate, energy and transport.[14] These documents are:

1. *The Roadmap for moving to a competitive low carbon economy in 2050*, COM (2011) 112;
2. *The Energy Roadmap 2050*, COM (2011) 885; and
3. *The Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*, commonly referred to as *the 2011 White Paper on Transport*, COM (2011) 144.[15]

The three policy documents presented fundamental aspects of the planned EU transition to a low carbon economy, milestones for the cost-efficient reduction of GHG emissions by 2030, and "no-regret options", which included more energy efficiency, higher shares of renewable energy, and development of energy infrastructure.[15] On the basis of these policy documents, the EU Parliament underlined the necessity of clear climate and energy objectives for 2030.

The Roadmap for moving to a competitive low carbon economy in 2050, COM (2011) 112, introduced an approach for possible actions up to 2050, which could enable EU to achieve the reduction of GHG emissions by 40 % as a sub-target for 2030[16], and by 80 to 95 % for 2050, compared to the level of 1990. The document outlined indicators, which would show whether EU is on the course for reaching these figures, policy challenges, investment needs, and opportunities in different sectors.[16] New, more advanced targets for renewable energy by 2020 were not proposed. It was stressed that technological innovations could help the transition to a more efficient and sustainable EU transport system by acting on three main factors: (1) vehicle efficiency through new engines, materials and design; (2) cleaner energy use through new fuels and propulsion systems; and (3) better use of networks, and more secure operation through information and communication systems.[16]

The document suggested that sustainable biofuels could be used as an alternative fuel, especially in aviation and heavy duty trucks, with strong growth in these sectors after 2030.[16] The extended use of biofuels could lead, directly or indirectly, to a decrease of the net GHG benefits, and increased pressure on bio-diversity, water management, and the environment in general. This would reinforce the need to use more advanced types of biofuels, and to proceed with the ongoing work on indirect land use change and sustainability.[16] Paper and wood products should be reused and recycled more, in order to reduce pressure on land use.[16] Any negative impact on other resources, for example water, soil and biodiversity, would need careful management.[16] The document accentuated the need to consider all land users in a holistic manner, and integrate the issues of land use, land use change and forestry (LULUCF) in the EU policy. The importance of a comprehensive approach that would intensify bilateral and multilateral engagements with the EU partners was highlighted.[16]

In *the Energy Roadmap 2050*, COM (2011) 885, it was explained that the EU approach to achieve the 2020 energy targets was ambitious, but it was not enough to achieve the newly set EU objective for the reduction of GHG emissions by 2050, also called the EU 2050 decarbonization objective.[17] The existing EU approach would help to reduce GHG emissions to about 40 % by 2050, which was not enough. The task of developing the post-2020 strategies and tools was urgent.[17]

The document recognized that reducing GHG emissions by over 80 % by 2050 would put pressure on the EU approach to energy.[17] It was predicted that electricity would have to play a much greater role in the future, almost doubling its share in the final energy demand to 36 – 39 % in 2050, and would have to contribute to the decarbonization in the EU transport sector.[17] Electricity could provide around 65 % of energy demand by passenger cars and light duty vehicles.[17] It was speculated that by 2050, the biggest share of energy supply technologies would come from renewable sources of energy. By 2030, the share of renewable sources of energy would be around 30 % in the EU gross final energy consumption.[17] There would be a need to invest in new renewable technologies, such as ocean energy, concentrated solar power, and more advanced types of biofuels.[17]

The process of decarbonization would require a large quantity of biomass for heat, electricity and transport. In the EU transport sector, a mix of several alternative solutions would be needed to replace traditional fossil fuels. Sustainable biofuels would probably be the main option for aviation, and long-distance road transport and rail, where it could not be electrified. Work to ensure sustainability, for example concerning the issue of indirect land use change, should be ongoing. The market uptake of new bioenergy, which would reduce demand for land necessary for food production, and which would increase the net GHG savings, such as more advanced types of biofuels based on waste, algae and forest residues, should continue to be promoted.[17] However, it is uncertain, which technological options would develop, at what pace, and with what consequences and trade-offs.[17] Technology was seen in the document as an essential part of the solution to the EU decarbonization challenge.[17]

The document warned that EU would need to consider progress and concrete actions in other countries. Its policy should not develop in isolation.[17] There would be a growing need for closer integration with neighboring countries and regions, and building energy interconnection and complementarities. The opportunities for trade and cooperation would require a level-playing field beyond the EU borders.[17]

The 2011 White Paper on Transport, COM (2011) 144, highlighted that the EU transport sector, which was a significant and still growing source of GHG emissions, must be sustainable in the light of coming challenges. The document promoted a non-binding goal to reduce the GHG emissions from the EU transport sector by 60 % by 2050, compared to the emissions in 1990, and by around 20 % by 2030, compared to the level of 2008.[19]Given the substantial increase in transport emissions over the past two decades, these goals would still put the GHG emissions 8 % above the 1990 level.[20] Strong international cooperation was required for effective actions.[20]

The document highlighted that the EU transport became cleaner, but because of its increased volumes, it remained a major source of noise and local air pollution.[20] Since *the 2001 White Paper on Transport*, COM (*2001*) 370[21], a lot had been done to enhance the environmental performance of the EU transport. Still, the EU transport system was not sustainable. Looking forty years ahead, it was clear that the EU transport sector could not develop along the same path.[20] The document underlined that coherence within EU was vital. For example, a situation where one EU Member State opted exclusively for electric cars, and another only for biofuels would destroy the concept of free travel across Europe.[20]

It was stressed that the primary goal of the EU approach to transport was to help establish a system that would strengthen the EU economic progress, enhance competitiveness, and offer high quality mobility services, while using resources more efficiently. In practice, the EU transport sector had to use less and cleaner energy, better exploit a modern infrastructure, and reduce its negative impacts on the environment and key natural resources, like water, land and ecosystems.[20] The choices that were made would determine the EU transport sector in 2050. Future development must rely on a number of features, such as improving the energy efficiency performance of vehicles across all modes, and developing and deploying sustainable fuels and propulsion systems.[20]

The document explained that urban transport was responsible for about a quarter of CO2 emissions from the EU transport sector.[20] The gradual phasing out of conventionally-fuelled vehicles from the urban environment would be a major contribution to

significant reduction of oil dependence, GHG emissions, and local air and noise pollution. It would have to be complemented by the development of appropriate fuelling and charging infrastructure for new vehicles.[20] Research on transport, and innovation policies in this field should increasingly support the development and deployment of technologies, needed to develop the EU transport sector into a modern, efficient and user-friendly system.[20] Measures should be promoted to increase the replacement of inefficient and polluting vehicles.[20]

In March 2013, the EU Commission issued a consultative *Green Paper on a 2030 framework for climate and energy policies*, COM (2013) 169. This document can be seen as a preparatory step for the development of the 2030 framework for the EU climate and energy policies.[22] It was aimed to consult stakeholders to obtain evidence and views, in order to support the development of the EU approach to energy and climate.[22] The document summarized that EU had a clear strategy to steer its energy and climate policies up to 2020, which integrated three headline targets, including:

- An EU based target for the reduction of GHG emissions of 20 %, relative to emissions in 1990;
- A 20 % share for renewable energy sources in the energy consumed in EU, with a specific target for each EU Member State; and
- 20 % savings in energy consumption compared to projections.[22]

Additionally, there were the 10 % target for the consumption of renewable energy in the EU transport sector, and the 6 % decarbonization target for transport fuels by 2020.[22] In 2010, the consumption of renewable energy in the EU transport sector reached 4.7 %, compared to only 1.2 % in 2005.[22] The EU approach towards 2020 recognized that the EU Member States used different energy mixes, and had different economic conditions and capacity to act. Due to this, mechanisms to ensure a fair distribution of efforts between the EU Member States were introduced.[22] However, the EU climate and energy package towards 2020 did not address a number of important issues. For example, the necessary transmission and distribution infrastructure for renewable energy was not defined.[22]

The 2013 Green Paper promoted that the EU approach towards 2030 must be based on the lessons from the experience already obtained by EU: what worked, what did not work, and what could be improved.[22] It was a challenge to ensure over time that renewable energy would become more cost-efficient.[22] Its use should be designed to avoid overcompensation, encourage high reductions of GHG emissions, strengthen innovation, ensure sustainable use of raw materials, and, particularly for biofuels, ensure compatibility with the WTO regulations.[22] The experience and views of stakeholders, backed up where possible with sound evidence, were essential in the search for satisfactory solutions.[22] The document pointed out that budgetary problems of the EU Member States and businesses, which had difficulty in mobilizing funds for long term investments, as well as the varying levels of commitment, and ambitions of international partners in reducing GHG emissions should be taken into account.[22]

In January 2014, *the 7th EU Environmental Action Programme (EAP)* was adopted, stressing that the current global aim was that people should live well within the limits of our planet.[23] The purpose of the program was to guide the EU environmental policy until 2020.[23] To give a more long-term direction, the program set out a vision beyond that, of where it wanted EU to be by 2050.[23] EU agreed to step up its efforts to protect our natural capital, to stimulate resource-efficient, low-carbon growth and innovation, and to safeguard people's health and well-being, while respecting the Earth's natural limits.[23]

The program listed nine priority objectives, and what EU needed to do to achieve them by 2020. Among these objectives, such examples can be named as (1) to maximize the benefits of the EU environmental legislation by improving its implementation; (2) to better integrate environmental concerns into other policy areas and ensure coherence, when creating new policy; and (3) to help EU address international environmental and climate challenges more effectively.[23]

The program emphasized that it was important to transform EU into a resource-efficient, low-carbon economy. This would require full delivery of the EU climate and energy package to achieve the 2020 targets, and agreement on the next steps for climate policy beyond 2020; significant improvements to the environmental performance of products over their life cycle; and reductions in the environmental impact of consumption, including issues of cutting food waste, and using biomass in a sustainable way.[23]

The program underlined that the competitiveness and capacity of EU for sustainable growth would depend on improving resource efficiency across the economy. A special focus should be put on turning waste into a resource, with more prevention, re-use and recycling, and phasing out wasteful and damaging practices.[23] The program stated that market mechanisms should reflect the true costs of products and services to the environment. This would involve applying the polluter-pays principle more systematically, avoiding environmentally harmful subsidies, shifting taxation from labor towards pollution, and expanding markets for environmental goods and services.[23]

Nothing was mentioned in the above observed policy documents about sustainability criteria for biofuels. The 2013 service document *Green Paper 2030: Main outcomes of the public consultation*, highlighted that sustainability was among the prime objectives of the EU energy policy.[23]

In 2014, two important EU policy documents were introduced:

1. *A policy framework for climate and energy in the period from 2020 to 2030*, COM (2014) 15; and
2. *Impact Assessment on energy and climate policy up to 2030*, SWD (2014) 15.

In *the 2014 policy framework for climate and energy*, COM (2014) 15, an approach for the EU climate and energy policies during the period from 2020 to 2030 was presented. The document proposed ambitious targets for renewable energy, and for the reduction of GHG emissions as a part of the EU transition to a competitive low carbon economy.[25] The question was formulated about the policy framework EU would need for 2030.[25]

The EU Commission called for the simplification of the existing EU approach, and the improvement of complementarity and coherence between the EU objectives and instruments.[29] It was stressed that regulations on renewable sources of energy would need to be substantially revised for the period after 2020.[29] The 20 % target for renewable energy finally consumed in EU should remain. However, while binding on EU, it should not be binding individually on the EU Member States. The 20 % energy target should be fulfilled through clear commitments decided by the EU Member States themselves, which should be guided by the need to deliver collectively the EU-level target, and build upon what each EU Member State should achieve in relation to their current targets for 2020.[29] The EU Commission did not estimate that it would be appropriate to establish new energy targets in EU, or the GHG intensity of fuels used in the EU transport sector, or any other EU sub-sector after 2020.[29]

According to *the 2014 policy framework*, food-based biofuels should not receive public support after 2020.[26] A range of alternative renewable fuels, and a mix of targeted policy measures would be needed to address the challenges of the EU transport sector in a 2030 perspective, and beyond. Sustainable fuels should be a part of a more holistic and integrated approach. The focus of the development should lie on improving the efficiency of the EU transport sector, and further development and deployment of electric vehicles, and more advanced types of biofuels. This fully corresponds to the alternative fuels strategy expressed in the EU policy document COM (2013) 17, and should be considered in future reviews and revisions of the relevant legal frameworks for the period after 2020.[29]

An improved EU policy on the biofuel feedstock should also encompass the sustainable use of land, and the sustainable management of forests in line with the EU forest strategy [28], as well as address ILUC effects.[29] The EU Commission's assessment of how to minimize

GHG emissions caused by indirect land use change suggested that biofuels of an agricultural origin would have a limited role in the decarbonization of the EU transport sector.[29] This is because of the uncertainty, whether any reduction of GHG emissions could be achieved in the cases of indirect land use change, compared to the use of traditional fossil fuels.[26]

The EU Commission put forward that the issues of land use change and forestry should be connected to the GHG reduction target for 2030, with the purpose to ensure that all sectors contribute in a cost-effective way to the mitigation efforts, agriculture, and sustainable use of land.[29] The new 2030 framework of EU must additionally take account of the current international situation and expected developments.[29] EU would have to step up efforts on research and innovation policy to support its post-2020 approach to climate and energy.[29]

The EU Commission pointed out that there was a need to simplify and streamline the current separate processes for reporting on renewable energy, energy efficiency, and the EU reduction of GHG emissions for the period after 2020. It was important to establish a consolidated governance process with the EU Member States.[15] The explicit EU aim should be to create more investor certainty and greater transparency, and to enhance coherence, coordination and surveillance.[15]

In *the 2014 Impact Assessment on energy and climate policy up to 2030*, it was underlined that the growing use of renewable energy in EU contributed to the globalization of the renewable energy industry. Many new markets of renewable energy emerged across the globe, in some cases even bigger than the EU market.[15] The share of renewable energy in the EU transport sector reached 1.2 % in 2005, and 4.7 % in 2010, compared to the 10 % energy target by 2020 in Directive 2009/28/EC. The EU Member States supported biofuels with the help of mandatory blending obligations in transport fuels, tax exemptions, and other support schemes.[15]

As projections indicated that EU would need considerable amounts of biofuels towards 2050, the EU Commission proposed increased incentives for advanced types of biofuels, which did not need land for their production, such as biofuels made from residues and wastes.[19] The EU Commission meant that in order for the EU transport sector to decarbonize in a cost-effective and sustainable manner, technological development of the advanced types of biofuels was necessary.[19]

The EU Commission noted that measures to promote energy efficiency and renewable energy generally contributed to the reduction of GHG emissions. Costs of reducing GHG emissions through such measures could be different. At the same time, measures of this kind could deliver additional benefits beyond GHG reductions, for example in terms of synergies with the efficiency of resources.[15] The EU Commission concluded that various policies underpinning the EU energy and climate targets for 2020 needed to be mutually supportive, and limit inefficiencies as much as possible.[15]

3. The EU Policy on Sustainable Biofuels in the Transport Sector

In *the 2013* EU Commission's *Renewable Energy Progress Report*, a less optimistic attitude to the development of the EU approach to renewable energy towards 2020, based on Directive 2009/28/EC, was revealed.[33] The analysis conducted by the EU Commission reflected the economic crisis, ongoing administrative and infrastructure barriers, and the disruption of policy and support schemes.[31]Fifteen EU Member States failed to reach their indicative 2010 targets for the share of renewable energy in the electricity mix.[31] In the transport sector, twenty two EU Member States failed to achieve their indicative 2010 target of 5.75 %.[32] Many EU Member States would evidently need further measures to ensure the achievement of their 2020 energy targets.[33]

It was explained in the report that there had been a strong initial start in the growth of the EU renewable energy under Directive 2009/28/EC, but the economic crisis was negatively affecting the development.[33] The EU Commission considered an amendment to the 10 % energy target in the transport sector, requiring greater use of the advanced types of biofuels for its achievement. More reliance on these types of biofuels, which were also expected to deliver higher GHG savings than food-based biofuels, would clearly require additional efforts.[33] The importance to reflect on savings of GHG emissions, resulting from using different types of biofuels was stressed in the report.[33]

Complying with the obligations under Directive 2009/28/EC, the EU Commission assessed the implementation, effectiveness and impacts of the EU approach to sustainable biofuels. It summarized that though the EU Member States' implementation of Directive 2009/28/EC was too slow, possible negative impacts of the EU biofuel consumption did not appear to warrant further. The savings of GHG emissions without including ILUC effects, as reported by the EU Member States, were positive.[33]

Reflections of the EU Commission on the needs for specific measures for air, soil and water protection, in connection to the production of biofuels, indicated that all the EU agricultural practices, which were obligatory under the EU Common Agricultural Policy and other environmental regulations, were applicable on biofuels of an agricultural origin. The EU Commission concluded that as such, separate biofuels-specific measures regarding these environmental issues were not necessary.[33] It pointed out that the existing sustainability regimes and voluntary sustainability standards often included requirements of the so-called good agricultural practice, and thus best agricultural practices for air, soil and water protection were encouraged by them. The EU Commission highlighted that when pressure on agricultural resources increased, it would be important to ensure adequate protection measures.[33] It was underlined that information about the origin of biofuels consumed in EU was important for monitoring purposes.[33]

Concerning the social sustainability of biofuels, the EU Commission was required to report on land use rights, since the EU demand for biofuels added to the existing international demand for food and non-food agricultural exports, and so to the pressure in developing countries to convert more land for cash crops.[33]

Earlier in 2012, *a communication from the EU Commission*, COM (2012) 595,[34] was issued, proposing to amend Directive 2009/28/EC. The purpose of the amendments was to limit the contribution made from food-based biofuels, and to promote an enhanced incentive scheme for sustainable and advanced types of biofuels from feedstocks that did not create an additional pressure on land. The document called for the transition to biofuels that delivered substantial GHG savings, when also emissions caused by ILUC were reported.[34]

The central aspects of the 2012 EU Commission's proposal were following:

- To limit the contribution of conventional biofuels[35] towards the achievement of the 10 % energy target in Directive 2009/28/EC to 5 %[34], minimizing the risks of uncounted GHG emissions caused by ILUC;
- To encourage a greater market penetration of the advanced types of biofuels with low ILUC effects, such as those made from wastes and algae, by allowing these types of biofuels to contribute more to the energy targets in Directive 2009/28/EC than conventional biofuels; and
- To improve the reporting on GHG emissions, by obliging the EU Member States and fuel suppliers to report the estimated GHG emissions of biofuels caused by ILUC.[34]

The EU Commission pressed the point that the future Directive on renewable energy should include provisions to address ILUC effects, taking into consideration that current biofuels were mostly produced from crops grown on the existing agricultural land.[34] It was argued that GHG emissions linked to ILUC were significant, and could negate some or all of the GHG savings of biofuels.[34] Due to these reasons, it was appropriate to limit the amount of food-based biofuels.[34]

The 2013 EU Strategy for Alternative Fuels can be found in COM (2013) 17. This document highlighted that initiatives to support alternative fuels in the EU transport sector, including biofuels, existed both at the levels of EU and the EU Member States. However, there was a need to establish a coherent and stable overarching approach, with a regulatory framework that would be friendly to investments.[34] It was observed that different technological solutions for transport were used in different parts of EU. This trend led to the fragmentation of the internal market, and created technology border lines, which hindered the mobility of alternatively fuelled vehicles across EU. Market penetration was hampered by the lack of infrastructure and common technical specifications, and required specific policy measures.[34] The document suggested that a strategic approach for EU to meet the long-term needs of all transport modes must be built on a comprehensive mix of alternative fuels. All options needed to be included, without giving preference to any particular fuel, preserving technological neutrality.[34]

It was acknowledged that biofuels remained the most important type of alternative fuels, accounting for 4.4 % in the EU transport sector by 2010. They could contribute to a substantial reduction in overall CO2 emissions, if they were produced sustainably, and did not cause ILUC. They could provide clean power to all modes of the EU transport. Still, supply constraints and sustainability considerations could limit the use of biofuels.[34]

With reference to COM (2012) 595, it was pointed out in *the 2013 EU Strategy* that the EU Commission had proposed to limit the amount of food-based biofuels, which could be counted towards the 10 % energy target in the EU transport sector, set in Directive 2009/28/EC, to 5 %. The EU Commission was willing to increase the incentives for the advanced types of biofuels, such as those made from ligno-cellulosic biomass, residues, waste and other non-food biomass, including algae and microorganisms. This was promoted with the purpose to mitigate against possible negative impacts of some types of biofuels. The opinion of the EU Commission was that after 2020 only the advanced types of biofuels should receive public support.[34] It was noted that the acceptance of biofuels by consumers was hampered by the lack of coordinated action across the EU Member States, when new fuel blends were introduced, the lack of common technical specifications, and the lack of information on the compatibility of new fuels with vehicles.[34] To avoid these problems, it was recommended to formulate high blend standards for biofuels.[34]

The document accentuated the need to extend the use of biofuels in aviation, with the aim to attain the target of two million tons of sustainable biofuels by 2020 for civil aviation in EU, as set out by the European Advanced Biofuels Flightpath, launched by the EU Commission in 2011[37] together with major airlines, aircraft manufacturers and biofuel producers.[27]

Subsequent policy document *COM (2013) 18*[38] contained the EU Commission's proposal for a Directive, aiming to ensure the build-up of alternative fuel infrastructure, and the implementation of common technical specifications for this infrastructure in EU. The proposal had the main focus on the use of electric vehicles. It required establishing a minimum number of recharging points for electric vehicles by each EU Member State, with 10 % of them being publicly accessible.[38] Biofuels were named in the proposal among the main alternative fuel options in the EU transport sector, together with electricity, hydrogen and natural gas.[38]

In September 2013, the EU Parliament amended the EU Commission's proposal made in COM (2012) 595. This led to the resolution on the proposal for a Directive, amending Directive 98/70/EC related to the quality of petrol and diesel fuels, and amending Directive 2009/28/EC on the promotion of the use of energy from renewable sources.[39] The EU Parliament considered it necessary to take into account ILUC effects on GHG emissions, and to adopt appropriate measures to address this issue. The revised Directive should have as its objectives: (1) ensuring a single market for fuels in the EU transport sector; (2) ensuring that minimum level of environmental protection is respected; and (3) avoiding adverse effects of the production and utilization of biofuels on food security and land use.

The EU Parliament emphasized that volumes of biofuels and bioliquids obtained from food and energy crops, which could be counted towards the energy targets set in Directive 2009/28/EC, should be limited. This was important, in order to prepare for the transition to the advanced types of biofuels, and to reduce to a minimum the global impact on ILUC in the period up to 2020. Amending the limit of 5 %, proposed by the EU Commission, the EU Parliament meant that the share of biofuels and bioliquids derived from cereals and other starch rich crops, sugars and oil crops, which could be counted towards the targets in Directive 2009/28/EC, should be limited to 6 % of the final consumption of energy in the EU transport sector by 2020.[40]

The EU Parliament's resolution highlighted that:

- Each EU Member State shall ensure that the share of energy from renewable sources in petrol in 2020 would be at least 7.5 % of the final consumption of energy in petrol in that EU Member State;
- In 2016, at least 0.5 % of the final consumption of energy in the EU transport sector shall be met with energy from the advanced types of biofuels; and
- In 2020, at least 2.5 % of the final consumption of energy in the EU transport sector shall be met with energy from the advanced types of biofuels.[40]

The EU Member States should require suppliers to ensure the placing on the market of petrol with a maximum oxygen content of 2.7 %, and a maximum ethanol content of 5 % until the end of 2018. Consumers should receive the appropriate information directly at the fuel filler pump.[40]

The EU Parliament requested that by one year after the date, on which the coming Directive would enter into force, the EU Commission should make recommendations for additional measures that EU Member States may take, with the purpose to encourage energy efficiency and energy savings in the EU transport sector. The recommendations should include estimates of the quantity of energy that could be saved by implementing each of those measures. In addition, Eurostat should gather and publish: (1) detailed trade related information on biofuels produced from food crops, such as those based on cereals and other starch rich crops, sugars and oil crops; (2) employment information on the numbers, duration and salaries, generated by the EU biofuel industry.[40]

According to the EU Parliament, EU should endeavour to conclude bilateral or multilateral agreements with third countries, containing mandatory commitments on provisions on sustainability criteria that would correspond to those of the coming Directive.[40]

The EU Commission shall before 31 December 2017 submit a report that would review the effectiveness of the measures introduced by the coming Directive in limiting GHG emissions, caused by ILUC during the production of biofuels and bioliquids. The report should be accompanied by a legislative proposal for establishing appropriate sustainability criteria for biofuels from non-land, using non-food crops.[40] It can be seen that the work, aimed at developing the EU sustainability criteria for biofuels continues.

4. The Position of the EU Parliament on the Coming EU Directive on Renewable Energy in April 2015

In its position on the coming Directive in April 2015, the EU Parliament observed that the 10 % energy target in the EU transport sector would be increasingly difficult to achieve sustainably, if the overall demand for energy in the EU transport sector continued to rise. Biofuels were expected to be the main contributor in the achievement of this target for all forms of transport by 2020. Blending of biofuels was expected to be one of the available methods.[40]

The EU Parliament explained that where grassland, or agricultural land previously destined for food and feed markets were diverted to the production of biofuels, the non-fuel demand should still be satisfied either through intensification of the current production, or

by bringing non-agricultural land into production elsewhere. The latter case constituted ILUC. When it involved the conversion of land with high carbon stock, it could lead to unexpected GHG emissions. Directive 2009/28/EC should therefore be amended to include provisions to address ILUC, given that current biofuels were mainly produced from crops grown on the existing agricultural land.[40]

Based on forecasts of biofuel demand provided by the EU Member States, and estimates of GHG emissions for different biofuel feedstocks linked to ILUC, the EU Parliament speculated that GHG emissions originated from ILUC could be significant. They might negate some or all of the GHG emission savings for different types of biofuels. These consequences could take place because almost the entire production of biofuels in 2020 was expected to come from crops grown on land, which could be used to satisfy food and feed markets. To reduce these GHG emissions, it was advisable to distinguish between crop groups, such as oil crops, sugars and cereals, and other starch-rich crops. It was necessary to encourage research and development of new advanced types of biofuels that would not be in competition with food crops, and to study the impact of different crop groups on both direct land-use change (DLUC) and ILUC further.[40]

The EU Parliament underlined that to prepare for the transition towards the advanced types of biofuels, and to minimize the overall ILUC effects, it was appropriate to limit the amount of biofuels produced from oil crops, sugars and cereals, and from other crops grown as main crops for energy purposes on agricultural land, which may be counted towards the 10 % energy target set in Directive 2009/28/EC.[40] The EU Member States should aim to phase out support for the consumption of the named types of biofuels.[40]

The EU Parliament pointed out that it would be desirable to reach a significantly higher level of the advanced types of biofuels already by 2020, compared to the current trajectories consumed within EU. Each EU Member State should promote consumption of the advanced types of biofuels, and set a non-binding national target for their consumption, which it shall endeavor to achieve.[41] Plans of the EU Member States for achieving their non-binding national targets should be published, where available, in order to increase transparency and predictability for the market. Advanced types of biofuels with low ILUC effects, and high overall GHG emission savings, as well as their promotion were expected to play an important role in the decarbonization of the EU transport sector, and the development of low-carbon transport technologies beyond 2020.[41]

The EU Parliament highlighted those current distinctions in estimated ILUC emissions could arise from different data inputs and key assumptions on agricultural development. Such inconsistent issues could be named, as trends in agricultural yields and productivity, co-product allocation, and observed global land-use change (LUC) and deforestation rates, which were not under control of biofuel producers. While a lot of biofuel feedstocks were produced in EU, the estimated GHG emissions caused by ILUC were mostly expected to occur outside EU, in areas where the additional production was likely to be realized at the lowest cost. The EU Commission should report to the EU Parliament and the EU Council on the effectiveness of the measures introduced in the coming Directive in limiting GHG emissions caused by ILUC.[41] The EU Commission should also report on possibilities for introducing appropriate sustainability criteria for dealing with GHG emissions caused by ILUC.[41]

The EU Parliament noted that voluntary sustainability standards played an increasingly important role in providing evidence of compliance with the sustainability requirements in Directive 2009/28/EC. Due to this, it would be appropriate to mandate the EU Commission to require voluntary sustainability standards to report regularly on their activity. The reports should be made public, in order to increase transparency, and to improve oversight by the EU Commission. This approach would additionally help to identify best sustainability practices in the biofuel industry.[41]

In April 2015, the EU Parliament voted to approve a new legal framework,[42] also called "the ILUC Directive", which limited the way the EU Member States could meet the 10 % energy target in the EU transport sector by 2020. There would be a cap of 7 % on the contribution of food-based biofuels, and a greater emphasis on the production of the advanced types of biofuels from waste feedstocks. The EU Member States must then include the coming legal framework in national legislations by 2017, and show how they were going to meet sub-targets for the advanced types of biofuels.[41] In July 2015, the act concerning the coming EU Directive on renewable energy was approved by the EU Council in its second reading.[43] At present, it is awaiting signature.

5. Volkswagen 2015 Emission Scandal

In September 2015, the US Environmental Protection Agency (EPA) sent a Notice of Violation of the US Clean Air Act [44] to Volkswagen AG, Audi AG, and Volkswagen Group of America, Inc. (collectively VW).[45] The EPA Notice of Violation alleged that Volkswagen and Audi diesel light-duty cars equipped with 2.0 liter engines from model years 2009 – 2015 include software that circumvents EPA emissions standards for nitrogen oxides (NOx) and other air pollutants. California issued separately an In-Use Compliance letter to Volkswagen.[46] EPA and the California Air Resources Board (CARB) both initiated investigations based on Volkswagen's alleged actions.[47]

Preliminary it can be explained that the cars named in the EPA Notice of Violation contain a sophisticated software device that turned off emissions controls when driving normally, and turned them on, when the car was undergoing an emission test. This design feature results in the cars emitting on the road up to 40 times more NOx pollution than the EPA emissions standards allow.[48] The misleading software device was installed on about 500 000 cars sold in the US, and as many as 11 million cars worldwide.[49]

The process started in the US, spread to a growing number of countries. Germany, the UK, Italy, France, South Korea and Canada opened investigations. All around the world, politicians, regulators and environmental groups started to question the legitimacy of Volkswagen emissions testing.[50] The consequences of Volkswagen 2015 emission scandal could be huge. Volkswagen could face criminal prosecution, not to mention billions of dollars in fines.[51] What is relevant for this article, the misleading software device installed in Volkswagen cars might have a negative impact on the calculations of GHG emissions in the EU transport sector, reducing the actual amount of NOx emissions, and other air pollutants. The latter issue should be thoroughly researched in the future.

6. Final Reflections and Conclusions

Much emphasis is put in EU on the development of renewable energy, and particularly sustainable biofuels in the EU transport sector. After Directive 2009/28/EC, it has been underlined once again that oil dependency for the EU transport has constituted 98 %. Under these conditions, biofuels have the potential to add to the improvement of the security of energy supply in the EU transport sector. The European Renewable Energy Council has expressed the opinion that vehicles powered by biofuels and electric cars would build the future EU transport system. The EU Commission has meant that sustainable biofuels would eventually be the main option for aviation, and long-distance road transport and rail, where it could not be electrified. An assumption can be made that biofuels should not be seen as a single solution for the future EU transport sector. They should rather be treated as a complement in the combination of several alternatives, which would be able to replace traditional fossil fuels.

The EU Commission has called to continue the ongoing work on sustainability, and on the issue of ILUC, as well as to consider all land users involved in the production of biofuels in an integrated manner. This indicates the direction of the development, which the EU approach to sustainable biofuels after Directive 2009/28/EC has been meant to have. A positive tendency is that much EU focus has been put on sustainable development and sustainability in the biofuel industry.

The vision expressed by the EU Commission for a 100 % renewable energy system in EU by 2050 is to the mind of the author

very ambitious. It may be more ambitious than what is likely to be achieved in practice. Already the current EU approach to achieve the 2020 energy targets set in Directive 2009/28/EC requires much input from the EU Member States. However, these efforts might not be enough to reach the newly formulated EU targets and policy objectives for 2050. The 40 % sub-target for the reduction of GHG emissions by 2030 seems to be more realistic. The research and development of sustainable and efficient post-2020 strategies and tools towards 2050 are important.

The EU Commission has outlined that various policies, which underpin the EU energy targets for 2020, would need to be mutually supportive, and limit inefficiencies as much as possible. Similar considerations can be referred to the fulfillment of the EU targets and policy objectives for 2050, and the sub-targets for 2030. It appears advantageous that the EU Commission has recognized that the EU approach to sustainability for transport should not be developed in isolation, and that the EU cooperation with other regions and countries in this field should be promoted and strengthened.

The initiative of the EU Commission to shift the focus on the development of more advanced types of biofuels, such as biofuels based on waste, algae and forest residues, should be especially stressed. The anticipations of the EU Commission are that the more advanced types of biofuels would reduce demand for land necessary for food production, and would increase the net GHG savings. Still, the issues of sustainability, efficiency and performing potential of the more advanced types of biofuels are unclear. Further analysis and discussions in this area are needed.

The EU Commission has proposed that the gradual phasing out of conventionally-fuelled vehicles from the urban environment would be a major contribution to the significant reduction of oil dependency, GHG emissions, and local air and noise pollution. The author of the article shares the standpoint that transport systems in the urban environment require special solutions. From a broader perspective, however, the EU transport sector cannot be regarded as sustainable. This is in spite of the fact that a lot has been done to improve its environmental performance.

The 7th EU Environmental Action Programme (EAP) is a comprehensive and advanced policy document that promotes and safeguards the ideas of sustainable development and sustainability. The global aim that people should live well within the limits of the Earth is clearly expressed there. Setting this aim is an important step forward, which signifies how the humanity should develop. Particularly, this aim restricts the quantity of products that may be made and consumed. It delimits how industries should plan and expand their future activities. Other ideas expressed in the 7th EU Environmental Action Programme, for example that much attention should be paid to turning waste into a resource, with more prevention, reuse and recycling, are of much value for sustainability and environmental protection.

After its assessment work, the EU Commission has underlined that special measures on some environmental issues, specific for the production of biofuels of an agricultural origin, would not be necessary. This is because the EU agricultural practices, which are obligatory under the EU Common Agricultural Policy and other environmental regulations, are applicable on these types of biofuels. At the same time, the EU Commission has stressed that when pressure on agricultural resources increases, it is important to ensure that protection measures remain adequate. It should be discussed to what extent the approach of the EU Commission is efficient from the point of view of sustainable development and sustainability.

The EU Commission has summarized that though the EU Member States' implementation of the requirements in Directive 2009/28/EC has been slow, possible negative impacts of the EU biofuel consumption should not lead to many difficulties. GHG emissions connected to ILUC have been significant, and could negate some or all of the biofuel savings of GHG emissions. This has been outlined as a critical issue that would require further research. The EU Parliament has explained that current distinctions in estimated ILUC emissions have been caused by different data inputs, and key assumptions on agricultural development. Such inconsistent issues can be named, as trends in agricultural yields and productivity, co-product allocation, observed global land use change, and deforestation rates, which are not under the control of biofuel producers.

In 2012, the EU Commission promoted the amendment of Directive 2009/28/EC, striving to shift to more advanced types of biofuels that could deliver substantial GHG savings with low ILUC effects, for example biofuels produced from non-eatable feedstocks. The EU Parliament has emphasized that almost the entire production of biofuels by 2020 has been expected to come from crops grown on land, which could be used to satisfy food and feed markets. It would be appropriate already by 2020 to limit volumes of biofuels obtained from eatable feedstocks, which could be counted towards the energy targets set in Directive 2009/28/EC.

The EU Parliament has observed that the 10 % target in the EU transport sector might become increasingly difficult to achieve sustainably, if the overall demand for energy for transport continues to rise. The EU Commission in its turn has proposed to limit the contribution that food-based biofuels could make towards the 10 % target in the EU transport sector. This has had the purpose to minimize the risks of uncounted GHG emissions linked to ILUC. It has been stressed that reporting on GHG emissions in EU should be improved. Besides, each EU Member State should promote the use of the more advanced types of biofuels, and set a non-binding national target for their consumption, which it shall endeavor to achieve. These innovations can be considered as positive and advantageous for the sustainable development of the EU transport sector.

In 2013, the EU Commission acknowledged that biofuels remained the most important type of alternative fuels, accounting for 4.4 % in the EU transport sector in 2010. They could contribute to a substantial reduction in overall CO2 emissions, if they are produced sustainably, and do not cause ILUC. In April 2015, the EU Parliament voted to establish a new legal framework, also called "the ILUC Directive". In July 2015, the text of the coming Directive was approved by the EU Council in its second reading. This Directive would hopefully improve the sustainable quality of biofuels in the EU transport sector, as well as secure conditions for investments in the biofuel industry.

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Analysis of the Main Innovations in Directive 2015/1513 on Renewable Energy

*Evgenia Pavlovskaia**

This article assesses the main innovations in the newly adopted Directive 2015/1513 on renewable energy and biofuels in the EU transport sector. It analyses the strengths and weaknesses of this legal framework and reflects on possible future elaborations of the EU approach to renewable energy and sustainable biofuels in the transport sector. These developments must be in balance with the production of food and non-edible products, with environmental protection, biodiversity, and the ecological limits of our planet. In the opinion of the author, Directive 2015/1513 is not likely to resolve the numerous challenges regarding biofuels for the EU transport sector. It might be erroneous to rely much on advanced types of biofuels, such as biofuels made from waste, algae and forest residues: future research might show that it is not realistic to supply the EU transport sector with the desirable amounts of these biofuels, because of limitations in the feedstocks. Improvements in the production process are evidently needed for biofuels, in order to increase their sustainability of production volumes and quality.

I. Introduction

After Directive 2009/28/EC came into force, it became noticeable that in spite of the sustainability criteria and other measures of caution[1] introduced in the Directive, the production of biofuels, and specifically food-based biofuels of an agricultural origin, could lead to considerable negative effects. These included, *inter alia*, competition with food markets, insecurity of food supply, unplanned and unwanted land use changes (LUC), and destruction of biodiversity and eco-systems. One of the main environmental challenges caused by the production of biofuels, became the displacement of existing agricultural activities to new geographic territories,[2] leading to unsustainable indirect land use changes (ILUC).[3] It was also recognized that ILUC could generate significant emissions of greenhouse gases (GHG),[4] which in some cases could result in nearly doubled GHG emissions over 30 years, and increased GHGs for 167 years.[5] It appeared difficult to set legal requirements to control ILUC cases and their effects, because these issues could lie beyond what was practically and technically possible to control for an ordinary biofuel producer.

According to Article 19(6) of Directive 2009/28/EC, the European Commission had an obligation to review the impacts of ILUC on GHG emissions and, if appropriate, to propose ways to minimize them, while respecting existing investments made in the production of biofuels. Following this legislation, the

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1 For example, reporting obligations of the European Commission (Art. 17 in Directive 2009/28/EC), and the EU Member States (Art. 22 of Directive 2009/28/EC) on various sustainability issues.

2 C. Malins, *A model-based quantitative assessment of the carbon benefits of introducing iLUC factors in the European Renewable Energy Directive* (2013) GCB Bioenergy 5/6 639 – 640; T. Zgajewski, *The EU regime on biofuels in transport: Still in search of sustainability* (2014) Egmont Paper 68, July 2014 12; K. Anderton and J. Palmer, *Evidence-based policy as iterative learning: The case of EU biofuels targets* (2015) Contemporary Social Science 10/2 142.

3 B. Wicke et al., *Indirect land use change: review of existing models and strategies for mitigation* (2012) Biofuels 3/1 87 – 88.

4 Communication from the EU Commission COM (2012) 595 final *Proposal for a Directive* 2.

5 T. Seachinger et al., *Use of U.S. croplands for biofuels increases greenhouse gases through emissions from land-use change* (2008) Science 319/5867 1239; J. Palmer and S. Owens, *Indirect land-use change and biofuels: The contribution of assemblage theory to place-specific environmental governance* (2015) Environmental Science and Policy 53 19.

Commission adopted a Communication in December 2010,[6] summarizing the consultations and analytical work conducted on this topic since 2008. In 2012, the Commission came up with a more detailed proposal for amending Directive 2009/28/EC,[7] with the aim of starting the transition to more advanced types of biofuels that would deliver substantial GHG savings, when also estimated ILUC emissions were reported.

The final compromise on the text of a new Directive on renewable energy was reached in April 2015. It limited to 7% the share of food-based biofuels, and biofuels from other crops grown on agricultural land, which could be counted towards the 10% renewable energy target in the EU transport sector.[8] In September 2015, the new Directive 2015/1513 was issued, amending Directive 98/70/EC on the quality of petrol and diesel fuels, and Directive 2009/28/EC on the promotion of the use of energy from renewable sources.[9] The new legal framework took into account many challenges connected to ILUC.

To outline the main innovations in Directive 2015/1513, analyze their potential strengths and weaknesses, and reflect on suggestions for improvements, the article explores a broad range of relevant EU legislation, policy documents, preparatory materials, explanatory legal doctrine and periodicals.

II. Background to Amendments to Directive 2009/28/EC

In October 2012, the European Commission presented amendments to Directive 2009/28/EC,[10] which included:

- limiting to 5% the share of food-based biofuels[11] that could be counted towards the 10% renewable energy target in the EU transport sector, to be reached by 2020;
- promoting advanced types of biofuels, produced mainly from waste and residues, by counting multiple times their contribution towards the 10% renewable energy target; and
- introducing reporting obligations for estimated GHG emissions caused by ILUC.[12]

The Commission's amendments, which above all sought protection for investments until 2020,[13] started a contentious debate on the following issues:

- At what level should a cap on the share of food-based biofuels be set?
- What are advanced biofuels? How, and to what extent, should advanced types of biofuels be promoted?
- Should the impact of ILUC on GHG emissions be taken into account and, if yes, how?[14]

In September 2013, the European Parliament adopted its First Reading position,[15] setting the cap on the share of food-based biofuels at 6% of the final consumption of renewable energy in the EU transport sector, to be reached by 2020.[16] This was 1% higher than the initial proposal of the European Commission, which promoted the 5% cap. In December 2013, the Council of the EU failed to agree on the compromised amendments and to rise the cap to 7%. Due to this, no decision was possible before the EU Parliamentary Elections in May 2014. Since December 2013, the Council's preparatory bodies continued to

6 Report from the EU Commission COM (2010) 811 final *on indirect land-use change related to biofuels and bioliquids*.

7 Communication from the European Commission COM (2012) 595 final *Proposal for a Directive*.

8 2012/0288 (COD) – 28/04/2015 *Text adopted by Parliament, 2nd reading* P8_TC2.

9 OJEU L 239 15.09.2015; signed by the President of the EU Parliament, and by the President of the EU Council on 9 September 2015.

10 Communication from the EU Commission COM (2012) 595 final *Proposal for a Directive*; T Zgajewski, *The EU regime on biofuels in transport: Still in search of sustainability* (2014) Egmont Paper 68, July 2014 23; European Lawyers Fratinivergano, *Trade Perspectives* (2015) issue 1.

11 There is no homogeneously accepted definition of how these types of biofuels should be called. They can also be called "first generation" biofuels, and conventional biofuels. In opposite, "second generation" biofuels, or advanced biofuels may be distinguished, which are made from waste, algae and forest residues; see explanations in European Lawyers Fratinivergano, *Trade Perspectives* (2015) issue 1.

12 Articles 2 and 3, and Annexes VIII and IX in Communication from the EU Commission COM (2012) 595 final *Proposal for a Directive*; European Lawyers Fratinivergano, *Trade Perspectives* (2013) issue 15 26-07-2013; European Lawyers Fratinivergano, *Trade Perspectives* (2013) issue 17.

13 T. Zgajewski, *The EU regime on biofuels in transport: Still in search of sustainability* (2014) Egmont Paper 68, July 2014, 24.

14 Green Car Congress, *European Parliament votes to cap crop-derived biofuels at 7% of transport energy consumption by 2020* (2015) 1 May 2015.

15 European Lawyers Fratinivergano, *Trade Perspectives* (2015) issue 1.

16 2012/0288 (COD) – 11/09/2013 *Text adopted by Parliament, 1st reading/single reading*; European Lawyers Fratinivergano, *Trade Perspectives* (2013) issue 17.

work on the proposal, with a view to facilitate political agreement, which was eventually reached in June 2014.[17] It was finally approved to have the cap on the share of food-based biofuels, and biofuels from other crops grown on agricultural land at 7%.[18]

In December 2014, the EU Transport, Telecommunications and Energy Council adopted its First Reading position on the draft Directive on ILUC, which amended Directive 2009/28/EC.[19] In April 2015, the European Parliament voted to establish a new legal framework, informally called "the ILUC Directive".[20] In July 2015, the text of the coming Directive was approved by the Council of the EU in its Second Reading.[21] In autumn 2015, the new EU Directive 2015/1513 came into force.[22]

III. Content of the Main Innovations in Directive 2015/1513

Directive 2015/1513, which amended Directive 2009/28/EC, maintains the obligatory 10% renewable energy target in the EU transport sector. However, the contribution to this target of food-based biofuels, and biofuels from other crops grown on agricultural land is capped at 7%.[23] The other 3% should come from a variety of multiple-counted alternatives, such as:

- biofuels from used cooking oil and animal fats, counted two times, see amended Annex IX, part B;
- renewable electricity in rail, counted two and a half times, see amended Article 3(4)(c);
- renewable electricity in electric vehicles, counted five times, see amended Article 3(4)(c);
- advanced types of biofuels, counted two times,[24] and with an indicative 0.5% sub-target, see amended Article 3(4)(e) and Annex IX, part A.[25]

The reporting and publishing of data on ILUC-related GHG emissions at both the EU and national levels are introduced, see amended Articles 23(4), 23(5), 23(8) and Article 22(1).[26] The list of the sustainability criteria for biofuels in the EU transport sector, set out in Article 17 of Directive 2009/28/EC is not changed.

The EU Member States shall seek to achieve a minimum proportion of food-based biofuels, and other biofuels, listed in amended Annex IX, part A, which would be consumed on their territory.[27] To that effect, each EU Member State shall set an indicative national sub-target for advanced types of biofuels that it shall endeavor to achieve.[28] As mentioned above, the reference value for this sub-target is 0.5% points in energy content, counting from the share of renewable energy in all forms of transport by 2020. EU Member States may set a national target lower than 0.5% points under certain conditions.[29]

To prevent materials from being modified, with the purpose to fall under amended Annex IX, the EU Member States shall encourage the development and use of systems, which would track and trace feedstocks, and the resulting biofuels over the whole production chain.[30] The EU Member States shall ensure that when fraud is detected, appropriate actions are taken.[31]

17 The EU Council ST 10300/14 *Proposal for a Directive* (2014) first reading, Brussels, 3 June 2014; T. Zgajewski, *The EU regime on biofuels in transport: Still in search of sustainability* (2014) Egmont Paper 68, July 2014 3–4.

18 Amended Art. 3(4)(d) in the EU Council ST 10300/14 *Proposal for a Directive* (2014); European Lawyers Fratinivergano, *Trade Perspectives* (2014) issue 13 27-06-2014; E. Ahern et al., *A perspective on the potential role of renewable gas in a smart energy island system* (2015) Renewable Energy 78 650.

19 The EU Council *Press Release* 16602/14 (2014) 3355th Council meeting, Transport, Telecommunications and Energy, Energy issues, Brussels, 9 December 2014.

20 2012/0288 (COD) – 28/04/2015 *Text adopted by Parliament, 2nd reading* P8_TC2; 2012/0288 (COD) – A8-0025/2015 *Results of vote in Parliament* 28/04/2015 Statistics; European Lawyers Fratinivergano, *Trade Perspectives* (2015) issue 8.

21 2012/0288 (COD) – 13/07/2015 *Act adopted by Council, 2nd reading*.

22 OJEU L 239 15.09.2015; signed by the President of the EU Parliament, and by the President of the EU Council on 9 September 2015.

23 See amended Art. 3(1) and 3(4)(d); biofuels produced from feedstocks listed in amended Annex IX would not be counted towards the 7% cap.

24 The contribution of advanced types of biofuels would be counted two times for the 10% renewable energy target in the EU transport sector, but not for the overall 20% renewable energy target, amended Annex IX, part A and Art. 3(4).

25 European Biofuels, Technology Platform, *Revision to the Fuel Quality Directive and Renewable Energy Directive* (2015) 22 June 2015.

26 See also Art. 3, *Review* in 2012/0288 (COD) – 28/04/2015 *Text adopted by Parliament, 2nd reading*.

27 Amended Art. 3(4)(e).

28 European Lawyers Fratinivergano, *Trade Perspectives* (2014) issue 13, 27 June 2014.

29 Amended Art. 3(4)(e).

30 Amended Art. 3(5).

31 Amended Art. 3(5).

In comparison to Directive 2009/28/EC, the list of definitions in Directive 2015/1513 is extended. Concepts such as "starch-rich crops", and "low indirect land-use change-risk biofuels and bioliquids" have been added.[32] More attention is paid to the influence of the biofuel production on the food market. The European Parliament had stressed earlier that addressing food and nutrition security at all levels is essential. Coherence between different policies should be pursued in cases of negative effects on food and nutrition security.[33] EU Member States should respect the Principles for Responsible Investment in Agriculture and Food Systems, approved by the Food and Agricultural Organisation Committee on World Food Security (CFS) in October 2014.[34] The European Parliament also called to align rules for using default values, in order to ensure equal treatment for producers, regardless of where the production takes place.[35]

The function of voluntary sustainability standards, accepted by the European Commission, is controlled more.[36] For example, the benchmarked voluntary sustainability standards shall regularly, and at least once per year, publish a list of their certification bodies, used for independent auditing. They shall indicate for each certification body: by which entity or national public authority it was recognized, and which entity or national public authority is monitoring it.[37]

EU Member States shall bring into force provisions necessary to comply with Directive 2015/1513 by 10 September 2017.[38] Member States shall also establish the level of their national indicative sub-targets for advanced types of biofuels by 6 April 2017.[39]

IV. Analysis of the Main Innovations in Directive 2015/1513

The new Directive 2015/1513 can be seen as a step forward towards a comprehensive and consistent legal framework for renewable energy and biofuels in the EU transport sector. In the view of the author, this legal framework highlights the importance of balancing the production of food and non-edible products with environmental protection, biodiversity and the ecological limits of our planet. The general opinion of some non-governmental organizations (NGOs) strengthens this point of view. NGOs, such as BirdLife, Greenpeace and the World Wildlife Fund (WWF), promote that any future EU policy recognises and considers limitations in the amount of land, forest and other biomass sources, on how much bioenergy can be produced sustainably.[40] The potential strong and weak sides of Directive 2015/1513 are analysed below.

1. Strengths

The ongoing debates and uncertainty in the period 2012-14 regarding the EU approach to renewable energy, and sustainable biofuels in the transport sector deterred investments in the biofuel industry.[41] It is expected that Directive 2015/1513 would contribute to making the investment climate more secure. It should also bring legal certainty that is needed for further innovative research.

The wider EU recognition of ILUC cases and their possible negative effects is one of the strengths of the new Directive.[42] The introduction of new concepts and their definitions, such as "low indirect land-use change-risk biofuels and bioliquids", is a positive trend in the development of sustainable biofuels.

The EU amendments started the transition from food-based biofuels, which have a controversial environmental impact, to more advanced types of biofuels. It is planned that the latter types of biofuels would be more sustainable and would deliver savings of GHG emissions. The introduction of the 7%

32 Amended Art. (2).

33 2012/0288 (COD) – 28/04/2015 *Text adopted by Parliament, 2nd reading* P8_TC2, point 18.a.

34 Committee on World Food Security, CFS, *Principles for Responsible Investment in Agriculture and Food Systems* (2014) October 2014; 2012/0288 (COD) – 28/04/2015 *Text adopted by Parliament, 2nd reading* P8_TC2, point 20.

35 2012/0288 (COD) – 28/04/2015 *Text adopted by Parliament, 2nd reading* P8_TC2, point 20.

36 Amended Art. 18.

37 Amended Art. 18(5).

38 Art. 4, *Transposition*.

39 Amended Art. 3(4)(e).

40 E. Casinge, *Parliament rubber stamps EU biofuels reform amid final controversy* (2015) Euractive, EU news and policy debates across languages, 29 April 2015.

41 European Biofuels, Technology Platform, *Revision to the Fuel Quality Directive and Renewable Energy Directive* (2015) 22 June 2015.

42 N. Humalisto, *Climate policy integration and governing indirect land-use changes — Actors in the EU's biofuel policy-formulation* (2015) Land Use Policy 45 156.

cap on the share of food-based biofuels, and biofuels from other crops grown on agricultural land that could be counted towards the 10% renewable energy target in the EU transport sector is important. Together with the intention of EU to phase out the use of food-based biofuels after 2020,[43] this innovation has potential to reduce the competition of biofuels with food supply, and to limit the damages of biofuel production to valuable lands, biodiversity and eco-systems.

Setting an indicative national sub-target for advanced types of biofuels, with the reference value of 0.5% points in the energy content, which the EU Member States shall endeavor to achieve, is another positive innovation. It is also aimed to facilitate the transition from food-based biofuels to more advanced and sustainable types of biofuels.

Extended control mechanisms and reporting obligations at both the EU and national levels is positive aspect in Directive 2015/1513. For example, estimated GHG emissions connected to ILUC would be made transparent with the help of the established reporting requirements.[44]

2. Weaknesses

The weaknesses of Directive 2015/1513, which can already be observed without awaiting the processes of implementation and enforcement, are regratably more numerous than the previously mentioned strengths. For example, Lane argued that the weakness of Directive 2015/1513 is that its provisions would only be valid until the end of 2020. This could result in the lack of necessary conditions for long-term planning and investments.[45] There are also doubts whether Directive 2015/1513 would be satisfactory from the perspective of environmental sustainability.

Humalisto explained that with the innovations in Directive 2015/1513, the European Commission continued its criticised governance of biofuels through the narrow setting of objectives. The Commission prioritised climate change mitigation above other issues. It chose not to legally regulate ILUC cases and their possible negative effects.[46] It did not focus on tools aimed at enhancing practices of land use, and improving land use planning, such as agro-economic zoning, biodiversity protection programs, development of monitoring, and utilization of degraded lands.[47] The approach of the EU Commission did not investigate how the involved actors could reduce ILUC, and its possible negative effects, related to the production of biofuels.[48] Opportunities to use non-arable land and waste water,[49] or sea water[50] for irrigation were not considered either. Instead, the European Commission reduced the role of food-based biofuels, and biofuels from other crops grown on agricultural land, with the purpose to avoid ILUC cases.

The opposing opinion may also be defended - that the scientific knowledge about ILUC is too vague and unclear for law-making. There is no scientific consensus on how to deal with this issue and to measure its effects.[51] ILUC cases can cause profound disagreements between EU Member States.[52] As an example, the multinational company Neste Oil (2010) under-

43 Communication from the EU Commission, COM (2012) 595 final *Proposal for a Directive*; Communication from the EU Commission COM (2014) 15 final *A policy framework for climate and energy in the period from 2020 to 2030*.

44 N. Humalisto, *Knowledge in Climate Policy Integration: How non-governmental organizations re-frame the sciences of indirect land-use changes for policy-makers* (2015) Environmental Policy and Governance 8.

45 J. Lane, *EU reshapes its biofuels policy* (2015) Biofuels Digest, 16 April 2015.

46 N. Humalisto, *Climate policy integration and governing indirect land-use changes — Actors in the EU's biofuel policy-formulation* (2015) Land Use Policy 45 155; the researcher emphasized that the EU approach to biofuels in the transport sector had increasingly become a question of its decarbonization, which was also the case in the ILUC policy-formulation, see N. Humalisto, *Knowledge in Climate Policy Integration: How non-governmental organizations re-frame the sciences of indirect land-use changes for policy-makers* (2015) Environmental Policy and Governance 2 – 3; see also the research of J. Palmer, *Biofuels and the politics of land-use change: tracing the interactions of discourse and place in European policy making* (2014) Environment and Planning A 46/2 337 – 352.

47 N. Humalisto, *Climate policy integration and governing indirect land-use changes — Actors in the EU's biofuel policy-formulation* (2015) Land Use Policy 45 156.

48 Ibid.

49 Z. Wen, *Algae for Biofuel Production* (2014) Extension, Farm Energy, 31 January 2014.

50 R. John et al., *Micro and macroalgal biomass: a renewable source for bioethanol* (2011) Bioresource Technology 102/1 188; S. Chinnasamy et al., *Algae – A Novel Biomass Feedstock for Biofuels* (2012) 224 – 239, in R. Arora (ed), *Microbial Biotechnology, Energy and Environment* (2012) CABI, Nosworthy Way, Wallingford, Oxfordshire OX10 8DE, UK 225 – 226, 237.

51 T. Zgajewski, *The EU regime on biofuels in transport: Still in search of sustainability* (2014) Egmont Paper 68, July 2014 12.

52 E. Casinge, *Lawmakers agree to limit food-based biofuels* (2015) Euractive, EU news and policy debates across languages, 16 April 2015.

lined that poverty and unemployment were rather the driving forces of certain ILUC situations, instead of the development of the biofuel industry.[53] The author of the article shares the latter point of view. Furthermore, the "food versus biofuels" argumentation may be insufficient, because high-protein animal feed can be produced from the co-products of biofuel processing.[54]

The solution to have the cap of 7% on the contribution of food-based biofuels, and biofuels from other crops grown on agricultural land can be seen as unnatural and controversial. It is a political compromise that would have impacts on the ordinary development of the biofuel industry.[55] It is uncertain in what amounts the remaining 3% of renewable energy from advanced types of biofuels could be delivered,[56] and what sustainability effects this would have. It can become difficult for the EU Member States to achieve this part of the 10% renewable energy target, because of the insufficient commercial availability of advanced types of biofuels.[57] Thus, the problem with advanced biofuels made of algae is that it is difficult to extricate oil from this plant.[58] It is also challenging to organize an uninterrupted supply of algae feedstocks for large-scaled production.[59]

In general, there are many questions and uncertainties about advanced types of biofuels, including biofuels made from waste and residues, promoted in Directive 2015/1513. The majority of these biofuels are still going through the processes of research and pilot testing. They would require more time to be fully developed. That is possibly why the EU law-makers took a less ambitious stand on advanced types of biofuels in the final text of Directive 2015/1513.

Reasons for setting the 0.5% indicative national sub-target for advanced types of biofuels, instead of introducing a binding target for this purpose can be discussed.[60] The EU previous experience showed that the achievement of indicative targets in the area of renewable energy might fail.[61] The level of 0.5% in the energy content might not be ambitious enough to promote the deployment of advanced types of biofuels. Besides, EU Member States have opportunities to go below 0.5%, which could further weaken the achievement of the 0.5% sub-target. More detailed research and analysis are required on the most appropriate forms and levels of a sub-target for advanced types of biofuels.

Directive 2015/1513 leaves many issues up to the Member States to decide, which may result in a diverging implementation of this legal framework at the national level, and a fragmented EU market for biofuels. Casinge observed that EU Member States have different capabilities and approaches to advanced types of biofuels. Some Member States are willing to go further than others.[62]

Criticism can be expressed that the innovations in Directive 2015/1513 are not as far-reaching and demanding as they should be. The new Directive does not consider how to address the potential negative consequences of biofuel production. It does not incentivise the production and use of biofuels with better GHG performance. The new Directive would probably not discourage oil companies from supporting and investing in traditional fossil fuels. In a nutshell, Directive 2015/1513 is unlikely to resolve the numerous challenges of sustainable biofuels in the EU transport sector and their sustainable production.[63] Conversely, radical changes in the EU approach to renewable energy and biofuels may lead to weak implementation, and the failure of the EU Member States in achieving the EU targets for renewable energy.

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53 ILUC Consultation Submissions, 2010.

54 J. Lane, *EU reshapes its biofuels policy* (2015) Biofuels Digest, 16 April 2015.

55 European Biofuels, Technology Platform, *Revision to the Fuel Quality Directive and Renewable Energy Directive* (2015) 22 June 2015.

56 E. Ahern et al., *A perspective on the potential role of renewable gas in a smart energy island system* (2015) Renewable Energy 78 650.

57 For example, see research about algal biofuels in A. Darzins et al., *Current Status and Potential for Algal Biofuels Production* (2010) National Renewable Energy Laboratory (NREL), USA, a report to IEA,Bioenergy Task 39 T39-T2 6-11-2010 iv – vi.

58 Ibid. 39, 46; Z. Wen, *Algae for Biofuel Production* (2014) Extension, Farm Energy, 31 January 2014.

59 R. John et al., *Micro and macroalgal biomass: a renewable source for bioethanol* (2011) Bioresource Technology 102/1 189; National Research Council of the National Academies, Committee on the Sustainable Development of Algal Biofuels, Board on Agriculture and Natural Resources, Board on Energy and Environmental Systems, Division on Engineering and Physical Science, *Sustainable Development of Algal Biofuels in the United States* (2012) the National Academies Press, 500 Fifth Street, NW, Washington, DC 20001, USA 121.

60 E. Casinge, *Lawmakers agree to limit food-based biofuels* (2015) Euractive, EU news and policy debates across languages, 16 April 2015.

61 European Biofuels, Technology Platform, *Revision to the Fuel Quality Directive and Renewable Energy Directive* (2015) 22 June 2015.

62 E. Casinge, *Lawmakers agree to limit food-based biofuels* (2015) Euractive, EU news and policy debates across languages, 16 April 2015.

63 Similar ideas were expressed in ibid.

V. Suggestions for Future Elaborations

The introduction of the 7% cap on the contribution of food-based biofuels, and biofuels from other crops grown on agricultural land can be regarded as a way out to avoid dealing with ILUC cases, and their potential negative effects. It is possible to exclude all types of biofuels with high ILUC estimates from contributing to the 10% renewable energy target in the EU transport sector.[64] This would go beyond the cap for food-based biofuels, for example restricting the production of oil-based biofuels. However, the author of this article agrees with the opinion of Humalisto that the EU should try to find appropriate approaches and tools for governing ILUC cases connected to the biofuel production. Casinge meant that after putting aside the ILUC issue, the EU should focus on the longer-term policy to decarbonise its transport sector, where sustainable biofuels do play an important role.[65]

Among the more general suggestions, it can be stressed that feedstocks for biofuels should be utilised in the most responsible and resource-efficient ways. Land for biofuels of an agricultural origin should be carefully chosen, in order to reduce negative impacts on biodiversity, eco-systems and water resources. Advancement is needed in biofuels processing, in order to increase their sustainability and production volumes. The search for more suitable solutions to develop the biofuel industry should be continued.

VI. Final Reflections and Conclusions

Since autumn 2015, the new Directive 2015/1513 on renewable energy and biofuels in the EU transport sector is in force. However, it is not clear whether the changes in this Directive meet the expectations of the involved actors. It is also vague whether Directive 2015/1513 will result in large-scale and constructive improvements.

In Directive 2015/1513, the initial 10% renewable energy target in the EU transport sector is not diminished, but a cap of 7% on the contribution of food-based biofuels, and biofuels from other crops grown on agricultural land is introduced. There was much uncertainty about the size of the cap, which was subsequently increased from 5% to 7%. Possible reasons behind these hesitations might be that it is difficult to rely on advanced types of biofuels, which are not commercially available in sufficient amounts at present.

The role of the 0.5% indicative sub-target is controversial. It is doubtful to what extent EU Member States are motivated to achieve it and what consequences for the development of the biofuel industry the fulfilment of this sub-target would have. Future research might indicate that it is not realistic to supply the EU transport sector with the desirable quantities of advanced types of biofuels, due to the limitations in their feedstocks.

The list of the sustainability criteria for biofuels in Directive 2015/1513 remains unchanged, if compared to its predecessor, Directive 2009/28/EC. Initiatives could be launched to improve it through regulating additional sustainability issues, such as the use of water, chemical pesticides and fertilizers, and genetically modified organisms (GMOs) during the production of biofuels. Mechanisms to control the fulfillment of the requirements in Directive 2015/1513 were extended. However, it is questionable whether the renewed control system would be satisfactory because it is still difficult to get a comprehensive insight in what happens outside EU.

Finally, it should be stressed that a sustainable future for the biofuel industry should be carefully planned and promoted. New solutions for the use of biofuels in the EU transport sector, and for renewable energy in general, are needed in order to create genuine benefits for people and our planet. Since hopes for the future of the EU transport sector are now resting on the use of advanced biofuels, an important task would be to develop sustainability criteria for these types of biofuels and their production.

64 K. Anderton and J. Palmer, *Evidence-based policy as iterative learning: The case of EU biofuels targets* (2015) Contemporary Social Science 10/2 145.

65 E. Casinge, *Lawmakers agree to limit food-based biofuels* (2015) Euractive, EU news and policy debates across languages, 16 April 2015.