

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 sustainable 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 interconnected 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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