

BIOMASS FUTURES

Biomass role in achieving the Climate Change & Renewables EU policy targets. Demand and Supply dynamics under the perspective of stakeholders . IEE 08 653 SI2. 529 241

Analysis of issues and concerns for policy makers in terms of implementing bioenergy requirements (Deliverable 6.3 under Biomass Futures)

Jane Desbarats and Bettina Kretschmer, IEEP



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Content

Content.....	2
Preface.....	3
1 Introduction	4
2 Future challenges for bioenergy development.....	4
2.1 Sustainability concerns	6
2.2 Implementation concerns	8
3 Concerns raised by policy makers.....	10
4 Mapping the bioenergy policy context	11
4.1 Research Objectives and Limitations and Policy Context.....	11
4.2 Solid Biomass: The example of wood chips/pellets.....	12
4.3 Biogas: Using slurry in an anaerobic digester	14
4.4 Biofuels: The example of biodiesel from rapeseed oil	15
4.5 Review of legislation.....	16
5 Conclusions	18
References.....	20
Appendix 1 – Conceptual Policy Maps	22

Preface

This publication is part of the BIOMASS FUTURES project (Biomass role in achieving the Climate Change & Renewables EU policy targets. Demand and Supply dynamics under the perspective of stakeholders - IEE 08 653 SI2. 529 241, www.biomassfutures.eu) funded by the European Union's Intelligent Energy Programme.

Section 4 of the report has been primarily prepared by Jane Desbarats (with contributions from Victoria Cherrier, Ben Allen, Andrew Farmer, Kaley Hart, Bettina Kretschmer, Ian Skinner and Emma Watkins)

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1 Introduction

This report is part of work package 6 'Support policy makers' of the Biomass Futures project (www.biomassfutures.eu). The aim of work package 6 is to provide information materials of various forms for policy makers across Europe. This includes an analysis of issues and concerns that arise for policy makers when implementing the bioenergy requirements of the EU Renewable Energy Directive 2009/28/EC (RED).¹

An analysis by Atanasiu (2010) of 23 National Renewable Energy Action Plans (NREAPs) shows that bioenergy (including solid biomass, bioliquids and biofuels) will contribute as much as 54.5% to the 2020 renewable energy target in these Member States. This implies the need to scale up bioenergy use significantly in absolute values. Overall, the bioenergy contribution to final energy consumption is expected to more than double, from 5.4% in 2005 to almost 12% (or 124 Mtoe in absolute terms) in 2020.

It is against this background that the Biomass Futures project aims at assisting Member States in meeting their bioenergy targets. The present report contributes to this end in the following ways: the more forward looking issues of concern are highlighted in the first part of the report along with future challenges in implementing the Directive's targets, especially those surrounding compliance with the sustainability criteria inherent in the RED. The second section highlights concerns and challenges as perceived by policy makers and reported in Biomass Futures events. The last section of the report maps the EU policy landscape in which bioenergy expansion will take place. In other words, it reviews existing policies apart from the RED that have an impact on bioenergy development. This analysis is structured along the supply chains of three selected forms of bioenergy, being wood chips/pellets as an example of solid biomass, biogas from slurry, and biodiesel from rapeseed oil as an example of a biofuel.

2 Future challenges for bioenergy development

Analysing the NREAPs has shown that overall EU Member States perceive bioenergy as the most important renewable energy source up to 2020. Analysis of the available NREAPs has shown that the share of bioenergy in total final energy consumption is likely to double over the next ten years. This constitutes a considerable increase in demand for biomass. The sheer size of this new demand triggers a range of concerns. At the same time, the demand for biomass in the food and feed sectors is projected to grow as well, with projections on food production increases up to 2050 ranging from 50% to 70%.² The most pressing issue that is thus raised in the context of future bioenergy development is the efficient use of finite resources, most notably arable land. These concerns bring with them a range of further likely impacts which will be discussed in more detail below.

The fact that there is a considerable range of stakeholders that are concerned with issues surrounding bioenergy has clearly been revealed by the last two public consultations that the European Commission conducted in relation to the sustainability scheme of the Renewable Energy Directive. In early 2010 (14.12.2009 to 08.02.2010), a consultation on the definition of highly biodiverse grasslands triggered close to 60 submissions. Later this year (30.07.2010 to 31.10.2010) a consultation on indirect land use

¹ Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources.

² See Allen and Lee (2010) for a concise discussion of land use drivers.

change (ILUC) triggered almost 140 submissions from public authorities, non government organisations, industry and citizens.³

For the purpose of this report, we group stakeholder opinions into three categories. The challenge for policy makers will be to navigate in an area where such conflicting opinions prevail.

1. A number of stakeholders, including environmental and development NGOs, have raised a range of sustainability concerns. Most prominently figure environmentally motivated concerns, advocating reduced stress on finite resources and the protection of biodiversity and ecosystem services. Along with such concerns, often go calls for reducing public support for bioenergy or at least for providing policy guidance, rules and incentives to make sure bioenergy promotion is sustainable.
2. The biofuel industry has concerns about the competitiveness of their products and typically fears further regulation as is, for instance, currently discussed in the context of indirect land use change. Also, stakeholders in this category often advocate enhanced policy support that clearly prioritises bioenergy over conventional energy sources. Producers from third countries also advocate free access to European biofuel markets.⁴
3. A mixed category accepts the given legislative framework as the status quo but has concerns about the proper implementation of existing provisions that are supposed to deal with sustainability concerns. Industry might have concerns that policy gaps or delays in implementation disrupt the functioning of the bioenergy market while environmentally motivated stakeholders might criticise the same shortcomings for undermining environmental safeguards in existing legislation.

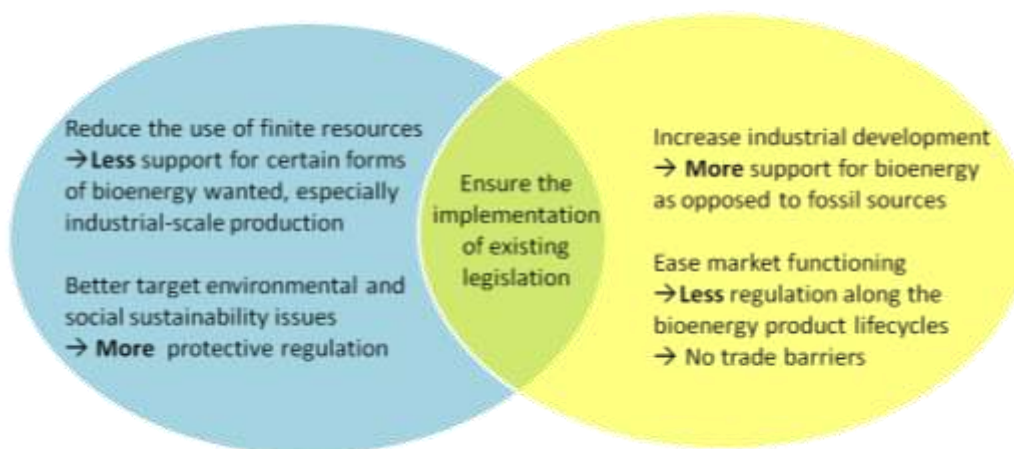


Figure 1. Sustainability versus industry concerns about bioenergy development

The industrial development concerns are of relevance for national policy makers who will be accountable for achieving their country's renewable energy targets as specified in the RED and for proceeding along the roadmaps mapped out in the National Renewable Energy Action Plans. However,

³ See http://ec.europa.eu/energy/renewables/consultations/2010_02_08_biodiverse_grassland_en.htm for the consultation on highly biodiverse grasslands and http://ec.europa.eu/energy/renewables/consultations/2010_10_31_iluc_and_biofuels_en.htm for the consultation on ILUC.

⁴ Especially ethanol faces a rather high excise duty of 0.19€/litre.

bioenergy is promoted as a solution to environmental problems most notably climate change and therefore its actual effects along a broader environmental dimension should not be negative. Once sustainability concerns have been taken into account and risks tackled, then industrial development concerns can be addressed. Following this logic we will therefore focus in the following on sustainability concerns and those related to their proper implementation.

2.1 Sustainability concerns

The focus of the bioenergy sustainability debate is on environmental issues both European and global. It is on environmental aspects that binding sustainability criteria have been included in the Renewable Energy Directive. The following paragraphs are focused on the environmental dimension while giving some space to social sustainability concerns as well.

Social sustainability challenges

The RED calls for the European Commission to report every two years to the European Parliament and the Council on the social impacts biofuel development has both in EU Member States and Third Countries. In particular these reports shall cover biofuels' impact on the "availability of foodstuffs at affordable prices, in particular for people living in developing countries, and wider development issues". They shall also "address the respect of land-use rights" (Article 17.7). The first report is to be submitted in 2012 and shall propose "corrective action" if appropriate, specifically emphasising the impact of biofuels on food prices.

Biofuels' impact on **agricultural and food prices** has been hotly debated especially after the price spikes for agricultural goods in 2007/2008. Biofuel policies in developed countries were blamed for having caused or helped to cause these developments, which were retrospectively probably caused by a combination of increased crop demand for biofuel production along with supply shortages due to bad harvests, reduced stocks, speculation on agricultural commodity markets and greater demand for meat and dairy products in emerging economies and thus an increased need for cattle feed. However, while bad harvests or reduced stocks are more temporary factors exerting upward pressure on agricultural prices, the increased demand for dairy and meat products and for biofuel feedstocks are seen as permanent drivers that will likely lead to sustained higher prices than at the beginning of the 2000s. The trend towards sustained higher agricultural prices can be seen in the recent OECD-FAO commodity projections published in their Agricultural Outlook report (OECD-FAO 2010), see Figure 2.

The issue of **land rights** is very relevant in light of the increasing practice of land-scarce countries leasing land in land-abundant, often developing countries. This leased land could be primarily used for producing strategic food resources. Nevertheless and irrespective of whether food or fuel resources are grown; the issue of land deals or 'land grabs' exemplifies the effects of increased demand for land, to which bioenergy development contributes. The practice of land deals raises serious concerns about the respect of customary land rights of smallholders. Also, concerns relate to whether local populations will benefit at all from such deals (by, for instance, agricultural know-how transfer) or whether investors will cultivate lands with the aim of short-term profits, neglecting the long-term fertility of the arable land.⁵

⁵ An illustration of land deals or 'land grabs' (status 2008) can be obtained from: <http://image.guardian.co.uk/sys-files/Guardian/documents/2008/11/21/LANDGRAB.pdf?intcmp=239>.

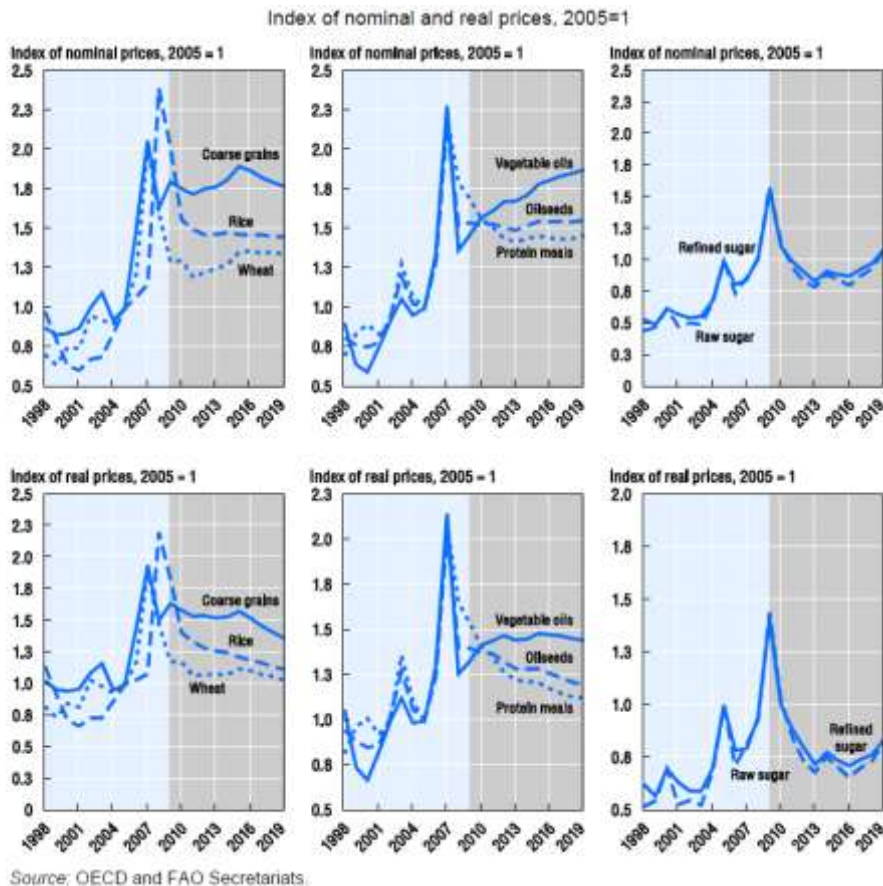


Figure 2. Outlook of world crop prices to 2019 (OECD-FAO 2010)

Environmental sustainability challenges

From an environmental point of view, there is an increasing tension between the growth of the bioenergy sector given legislative drivers, and the lack of adequate conservation efforts throughout the EU and (often even more so) beyond. The following account of environmental sustainability is not exhaustive but rather picks out particular aspects that are challenging from an implementation point of view. A wider view on sustainability issues is taken by Work Package 4 of the Biomass Futures project. Policy communication of WP4 findings will be one of the main tasks under WP 6 for the next period of the project.

The sustainability criteria of the RED apply to biofuels and bioliquids and **focus on greenhouse gas (GHG)** accounting by including a minimum GHG savings requirement for biofuels as compared to fossil fuels and by preventing the conversion of high carbon stock land into arable land used for biofuel and bioliquids feedstock cultivation. In addition to that, the conversion of land of high biodiversity value is prohibited. Article 17.7 of the Directive mentions further issues of environmental concern such as soil, water and air protection on which the Commission is to report to the European Parliament and the Council every two years and for the first time in 2010.

A report by the European Commission issued in 2010⁶ recommends **no binding European sustainability criteria for solid and gaseous biomass** for the time being. The report also recommends sustainability

⁶ Report from the Commission [COM(2010)11] Report from the Commission to the Council and the European Parliament on sustainability requirements for the use of solid and gaseous biomass sources in electricity, heating and cooling.

BIOMASS FUTURES

criteria along the lines of those for biofuels and bioliquids for those Member States that want to develop national sustainability legislation for solid and gaseous biomass. The Commission will reassess the need for harmonised criteria by the end of 2011. From an environmental-protection point of view, it would be welcome to extend criteria to solid and gaseous biomass and to widen the set of sustainability criteria itself in scope to encompass binding criteria on issues such as water, soil and air protection instead of reporting requirements only.

A major outstanding issue related to the greenhouse gas performance of biofuels is the issue of **indirect land use change (ILUC)**. The Commission's report on this issue is due at the end of 2010. ILUC does not only occur when additional biofuel feedstocks are grown but is also a consequence of other changes in demand that require additional land use in one location without any reduction in the overall requirement for agricultural commodities previously grown on that land. As a consequence, land use needs are shifted elsewhere. However, it must be appreciated that there are two reasons why the ILUC question is of particular weight in the case of biofuels. One is the unusually large volume of demand for new land driven largely by policy interventions supporting bioenergy. The other is that biofuels are being promoted as a low-carbon alternative for the transport sector leading to reduced emissions compared to fossil fuels; whether biofuels fulfil this role needs to be verified. At the same time bioenergy production is only one part of a spectrum of agricultural and other land-use activities all exerting pressure on the limited resource of land. Increased demand for land for the purpose of food production resulting both from a growing world population and changing eating habits is crucial as well; so are pressures resulting from the potentially higher demand for non-energetic industrial biomass use, urbanisation etc. It is important to consider the different drivers as a whole in order to understand future land use dynamics.

While most discussions centre on the finite resource of land being a limiting factor for bioenergy development one should also keep in mind the finiteness of other production factors, most notably **water**. Agriculture is the by far largest user of fresh water resources accounting for 70-80% of global use. Bioenergy promotion is likely to enhance water stress and impact both the quantity and quality of fresh water. Gerbens-Leenes (2009) examined the varying water content of different biofuel and bioelectricity pathways with highly diverging results. In very broad terms, they find that the water footprint of biofuels tends to exceed the water footprint of bioelectricity and that the biodiesel outweighs the ethanol water footprint. UNEP recommends increasing the efficiency of water use in the cultivation stage and relying on feedstocks that are suitable for the geo-climatic conditions prevalent in a particular production site, i.e. native species. It is admitted that this could come at the expense of lower yields. The quality of fresh water is primarily influenced by fertiliser run-off. Precision agriculture techniques and multi-cropping systems integrating nitrogen fixing crops could reduce the need for fertiliser input and hence lessen the environmental hazards (such as 'dead zones' in natural water reservoirs) associated with run-off. Water requirement for second generation fuels are not well understood yet adding to the perception that future research efforts on the bioenergy-water nexus should be scaled up (UNEP).

There is a potential conflict between growing native species with little water requirements but also lower yields and aiming for high-yielding crops so as to reduce the overall need for land for bioenergy purposes. The current RED provisions would decide the conflict to the benefit of the latter: While the RED provisions do provide some incentive for using high-yielding crops as yields per hectare influence biofuels' lifecycle GHG emissions, there are no binding water-related criteria.

2.2 Implementation concerns

A major policy challenge in the coming months and years will be the proper implementation of the sustainability scheme of the RED. While this relates currently only to biofuels and bioliquids, the European Commission will reassess at the end of 2011 whether binding sustainability criteria could be introduced for solid and gaseous biomass as well. In that sense, the **criteria for liquid fuels represent a kind of precedent** to achieve accountable sustainable supply chains for agricultural products and renewable energy supplies. Due to this precedent character and the possibility of extending criteria to

other forms of bioenergy (and potentially to other agricultural products in the longer term), the importance and relevance of properly implementing the biofuel and bioliquid criteria go beyond the biofuel and bioliquid sectors.

The **implementation deadline** for the RED and thus also for the sustainability criteria is on December 5, 2010. However, not all provisions are yet in place. Most notably, the definition of highly biodiverse grasslands that are not to be converted for biofuel feedstock cultivation is currently still missing. If legislation on indirect land use change is to be adopted in 2011, this will add a further element to the sustainability scheme that is currently not included.

IEEP work on **highly biodiverse grasslands** has been conducted with the aim of clarifying the *criteria and geographic ranges* of highly biodiverse grasslands and guide the implementation of grassland related provisions in the RED. It is important to stress the point that the RED does not introduce a hierarchy between highly biodiverse natural and non-natural grasslands; these are deemed as equally important to protect. IEEP proposes four different categories of non-natural grasslands that aim at facilitating the understanding of the varying types of non-natural grasslands, which can range from intensively managed non-natural grassland with a low biodiversity value to semi-natural grasslands that may be extensively grazed or mowed and typically host a rich biodiversity.⁷ The challenge of implementing any grassland provisions will be to protect natural and non-natural grasslands with high biodiversity value alike. To this end, it is of particular importance to effectively communicate the potential biodiversity value of different grassland habitats and that non-natural grasslands, while in use for example as pasture, could also be a priority in conservation terms. A major challenge will, however, also be to find a balance between effective protection and preventing excessive burden especially for small-scale producers. IEEP suggested a three-level approach to assess the biodiversity value of a grassland. In this context, there would not be the need for a detailed ecological impact assessment for readily classifiable grasslands.⁸

Crucial 'players' in assuring the implementation of sustainability criteria will be **voluntary schemes** that can be recognised by the European Commission as providing accurate evidence that all or part of the sustainability criteria are met. It is then up to the voluntary schemes to assess whether sustainability criteria are met along the biofuel supply chain. Once a voluntary scheme that is recognised by the European Commission issues a sustainability certificate for a consignment of biofuel or for a consignment of raw material, all Member States must respect the proven sustainability of this consignment.⁹ A range of voluntary schemes is currently set up or being extended; many of those have been in place before and are adjusting their provisions to gain RED recognition. There are product-specific schemes e.g. the Roundtable on Sustainable Palm Oil (RSPO) or the Roundtable on Responsible Soy Association (RTRS); there are also schemes that aim to certify the whole of arable or agricultural production within a given country, for example the Assured Combinable Crops Scheme (ACCS) or the Genesis Quality Assurance Scheme (both operating in England). ISCC is a scheme which aims to operate internationally and to encompass a range of biomass and bioenergy products.

A swift recognition of voluntary schemes is essential for the implementation of the sustainability scheme. Voluntary schemes may represent a cost-effective way of complying with sustainability criteria and their recognition by all Member States will facilitate trade in sustainable feedstocks and biofuels. IEEP research in the area of voluntary schemes (and the feasibility of including the IEEP grassland approach within these schemes) revealed that producers tend to favour commodity-based voluntary schemes for certifying biofuel feedstocks, which certify a given crop, or series of crops. The reason for

⁷ See Bowyer (2010) for an extensive discussion and definition of highly biodiverse grasslands.

⁸ See Bowyer et al. (2010b) for a paper outlining this three-step approach.

⁹ For details on the working of voluntary schemes see: Communication (2010/C 160/01) of 19.6.2010 from the Commission on the practical implementation of the EU biofuels and bioliquids sustainability scheme and on counting rules for biofuels.

this is that producers are often unclear about the ultimate market for their product (Bowyer et al. 2010a).

During Biomass Futures workshops¹⁰, both policy makers as well as industry representatives frequently raised the concern that they project a shortage in supply of sustainable biomass. In other words, making sure that the sustainability schemes are up and running in all Member States in order to have sufficient sustainable biomass available is a key challenge for policy makers. At the same time, it should be stressed that the biofuel and bioliquids sustainability criteria represent a good opportunity to engage both industry and NGOs and other sustainability stakeholders with the common goal of making commodity supply chains sustainable. The engagement of both industry and NGOs in the development of voluntary schemes exemplifies this development. Policy makers would do well to facilitate this dialogue further: These forms of cooperation could have an important impact beyond biofuels and bioliquids by contributing to the evolution of sustainability standards and sustainable supply chains for a wider range of commodities and sectors.

3 Concerns raised by policy makers

This section summarises concerns that were collected during engagement with policy makers as part of Biomass Futures. The following statements were collected during the Biomass Futures policy workshop on 26 November 2010 in Brussels.¹¹ Member State representatives were asked whether they are aware of certain issues that are a problem in implementing the requirements of the RED and whether there are gaps in policy, guidance or research. These could be taken up in the further course of Biomass Futures' work.

The **Romanian** participant mentioned that meeting supply requirements is a major problem in terms of the prices the farmers can get for their products. Also, there is concern about the different payment rates for agriculture support under the Common Agricultural Policy (CAP) between Member States. These help to support or cushion costs involved with production and supply. Having said this, she also mentioned that Romania does have a large bioenergy potential.

The **UK** mentioned that the availability and even more so the accessibility of sustainable biomass is problematic to secure. The collection and transport of residues and wastes, for instance, does raise practicability problems. Also, the affordability between the different market segments, e.g. electricity, transport and heating differs; i.e. for example the transport and heat sectors pay different prices and can thus afford different costs for resources. As a result some of the available biomass is accessible for some sectors and not others.

The **Flemish** representative mentioned that Belgium has to import biomass to achieve its goals with bioenergy so as to reach the overall RED target. However, the government wants to have certainty that the imported biomass is sustainable. So he stresses the importance of sustainability criteria and the need for binding criteria. Also, there are concerns whether there is enough sustainable biomass on the international market. He further mentioned other uses and competition between fibre/industrial and energy uses. Others argued that with price competition between different uses giving specific support to the energy sector would distort prices on the market, thus indeed causing competition problems that go beyond the normal market mechanisms. Another advice from the Biomass Futures team was to use the

¹⁰ This refers most notably to the policy workshop on the 26th of November at IEEP Brussels and the sustainability workshop on the 30th of November 2010 at Öko-Institut, Berlin.

¹¹ For workshop documentation, see: http://www.biomassfutures.eu/public_docs/workshops_2010/26_nov_2010_brussels/26_nov_2010_brussels_agenda.pdf and the Biomass Futures deliverable 6.6 containing a detailed report on the workshop.

cooperation mechanisms provided for in the RED. However, the MS representative reported scepticism among Member States (expressed in the concerted action group) about the actual operation and workability of the cooperation mechanisms (legal hurdles, making commitments). These remain to be explored further.

The **Hungarian** representative explained their preference for decentralised, small to medium-sized bioenergy units as Hungary has a well-developed district-heating system. However, there also have to be compromises between size and economies of scale. There is strong commitment for second-generation biofuels with the first commercial plant up and running. He expressed the possibility for Hungary to leapfrog first-generation fuels and to jump straight into second-generation as they become more widely spread. A large first-generation plant has been constructed close to the Romanian border with feedstocks to be imported from Romania. Since Hungary has a lot of agricultural by-products, it makes sense to go for second-generation.

Finally, a **Shell** representative stated that while it is helpful to adopt an economic perspective on where best to put biomass into the energy system, the economic dimension is only one thing. Also in addition, one has to consider the alternatives and there are not many alternative fuels in transport currently. The **JRC** participant said that there is a mismatch between biomass supply and RED induced demand; mobilisation of biomass is thus key to securing supply. Also, monitoring the trajectories proposed by Member States are important for making sure targets are going to be met.

4 Mapping the bioenergy policy context

The driving force behind the uptake of bioenergy is the Renewable Energy Directive (RED) which requires Member States to generate 20% of energy from renewable sources by 2020, and for 10% of transport fuels to be made up of renewable resources. Member States are expected to outline pathways to meet the RED targets as part of National Renewable Energy Action Plans.

The purpose of this section is to provide policy makers with a general overview of how a range of EU policies beyond the RED interact with the bioenergy sector. It illustrates the far reaching implications of the bioenergy issue given the fact that this renewable source of energy cross-cuts a number of sectors and their associated policy fields with respect to downstream and upstream elements of the product life-cycle. The interactions between the bioenergy sector and other EU level policies are illustrated through a series of conceptual policy maps¹².

4.1 Research Objectives and Limitations and Policy Context

The present analysis focuses on three examples:

1. solid biomass in the form of wood chips and pellets based on wood residues;
2. biogas from pig slurry derived from anaerobic digestion; and
3. biodiesel from rape seed oil

It is not the aim exhaustively to describe all the relevant legislation pertaining to bioenergy. Considering the example forms of bioenergy mentioned, it is rather meant to illustrate the complexity of the

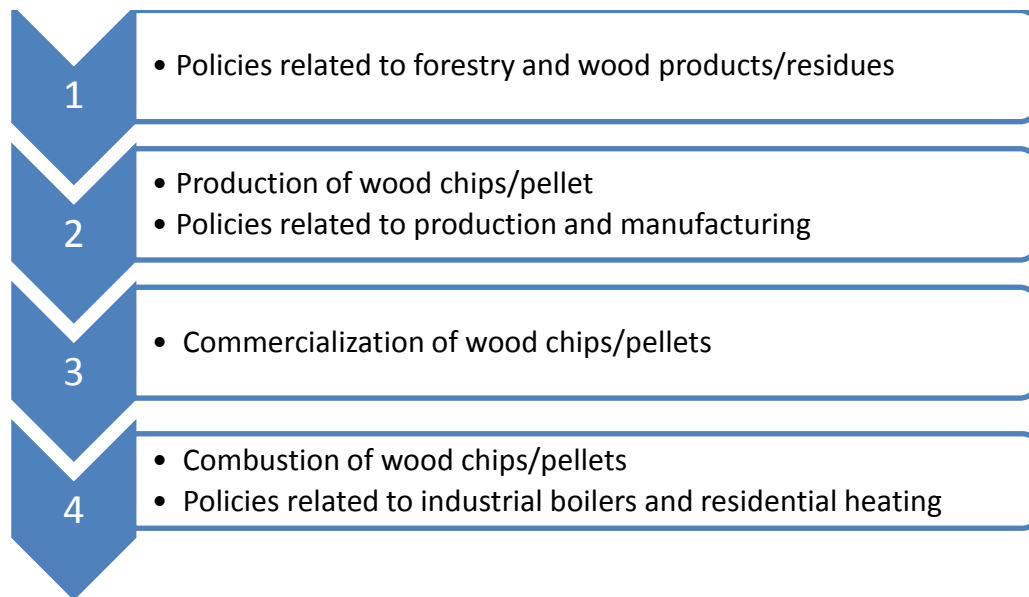
¹² For a discussion of conceptual policy maps see: Farmer, A.M. (2011). Cross-scale governance and the analysis of policy implementation for water management, with particular regard to climate adaptation, industrial pollution and impacts of agriculture. *Journal of Water and Climate*. In Press,

industry, and its supply chains and its far reaching resource implications. The scope of the exercise is limited to legislation that would trigger a demand for additional resources, or that would have a more tangible effect on the natural environment. In some cases, while the authors of this report may have hypothesized with respect to the implications of relevant legislation, the identified Directives often do not make any direct references to bioenergy. The forthcoming Industrial Emissions Directive, for example, will be relevant to certain elements of the product life cycle for wood pellets, but bioenergy is not explicitly mentioned in the Directive.

The focus of the analysis is on Directives that relate to an increased demand for resources. There a number of Directives relevant to the transportation of goods, and to the chemical make-up of animal by-products, but these were not reviewed here. This is because they impose no additional or different provisions for bioenergy than conventional energy, for example conditions regulating transport apply equally to diesel and biodiesel. In cases where legislation does not exist, references have been made to private sector initiatives to help illustrate the increasing commercial importance of the industry.

4.2 Solid Biomass: The example of wood chips/pellets

Four distinct stages of the product cycle for the production of wood chips and pellets were reviewed. Legislation relevant to the transportation of the inputs and outputs was not reviewed as part of this analysis, as noted above. The product cycle is illustrated as follows:



Stage 1: There are two types of feedstock to consider as part of Stage 1. There is the feedstock related to harvested forestry residues, and sawdust and related processing residues that are the main source for wood pellets. We will focus on policies that relate to residues accruing from harvesting timber.

There are two plausible scenarios for harvested forestry residues as part of Stage 1. Firstly, there may be an increasing demand for harvested wood residues in cases where wood chips are being manufactured in close proximity to feed-stocks. In this case industry might need to undertake an Environmental Impact Assessment (EIA) of the new activity.¹³ This could trigger consideration of the

¹³ Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment.

requirements arising from complimentary legislation including the **Birds¹⁴ and Habitats¹⁵ Directives**. Both Pillar II of the **Common Agricultural Policy (CAP)** and the **EU Forest Action Plan¹⁶** encourage the use and management of forests for bioenergy to some degree with afforestation incentives, illustrating how, given the projected growth of the industry, there is an incentive for land managers to plant more forests.

At the same time, wood waste suppliers may be required to comply with provisions limiting supply. However, as discussed below with reference to the EU Forest Action Plan, there is currently no legislation requiring the conservation of the great majority of commercial forests.¹⁷ In cases where forest products are being harvested near rivers for example, particular attention would need to be paid to the sediment generated as a result of forestry management. This may trigger the need for management changes in order to comply with the water quality requirements of the **Water Framework Directive**.¹⁸ Issues related to the storage and disposal of harvested forestry residues would be subject to the **Waste Framework Directive**.¹⁹

Another source of bioenergy can be derived from waste products from the pulp and paper industry. There are a number of Directives that are relevant to the operation of the Pulp and Paper industry. Pulp and paper mills are regulated by both the **IPPC²⁰** and by the **EU-ETS Directives**.²¹ Waste products would also be subject to the Waste Framework Directive. The main residue used for energy purposes is black liquor, which is burned to retrieve process energy and potentially also for generating excess electricity.

Stage 2: There are no Directives that regulate the production of wood chips or pellets per se. As a sector or subsector, it is not regulated under either the IPPC Directive (or its future replacement, the **Industrial Emissions Directive²²**) or under the EU-ETS Directive. There is however, a pan-European standard under development for all kinds of solid biofuels including wood chips and pellets.²³

Stage 3: No European policies have been identified related to the commercialisation of wood chips and/or pellets.

¹⁴ Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds.

¹⁵ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

¹⁶ Communication from the Commission to the Council and the European Parliament on an EU Forest Action Plan Brussels, 15.6.2006, COM(2006) 302 final.

¹⁷ Note that conservation of certain forests may be required with respect to the implementation of the Habitats Directive.

¹⁸ Directive 2008/105/EC of the European Parliament and of the Council on environmental quality standards in the field of water policy and amending Directive 2000/60/EC.

¹⁹ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

²⁰ Directive 2008/1/EC of the European Parliament and of the Council of 15 January 2008 concerning integrated pollution prevention and control.

²¹ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community.

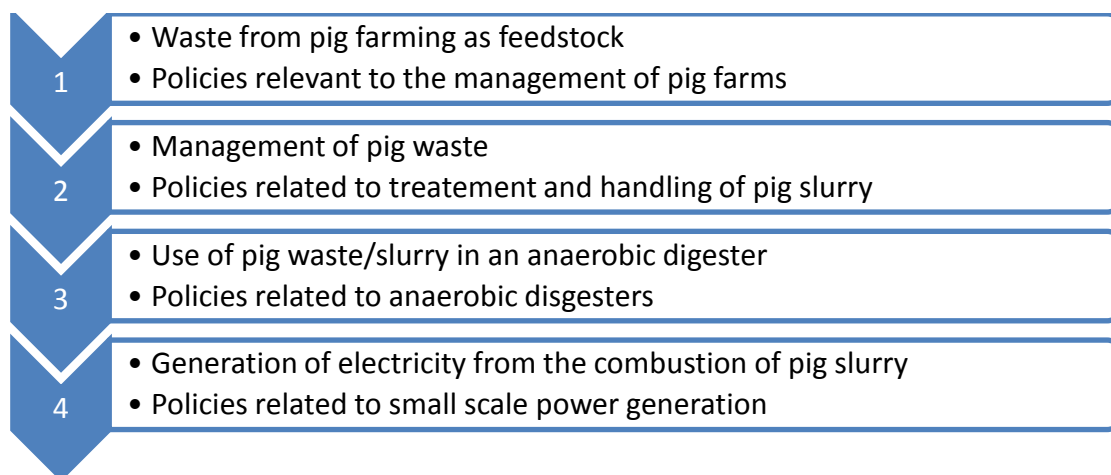
²² Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast).

²³ CEN/TC 335 develops the draft standard to describe all forms of solid biofuels within Europe, see: http://www.biomassenergycentre.org.uk/portal/page?_pageid=77,19836&_dad=portal&_schema=PORTAL.

Stage 4: Wood chips and pellets can be combusted either as part of residential heating applications, or in industrial boilers. While the conceptual policy map refers to the consideration of both the IPPC directive and the EU-ETS, it is likely that uptake of the technology will be small scale, and would, therefore, in many instances be below the thresholds for inclusion in the regulatory requirements of one or both Directives (see description of EU-ETS and IPPC provisions below). The Directive on **Combined Heat and Power**²⁴ may be applicable in a few cases where co-generation takes place. Pillar II of the CAP provides for some investment aid grants for setting up combustion devices: If wood chips/pellets are burned on-farm, they might be eligible for investment aid under 'farm modernisation measures'. If the energy is to be consumed within a local renewable energy initiative, it may be eligible for investment aid under another Pillar II measure, 'Basic services for the economy and rural population'.

4.3 Biogas: Using slurry in an anaerobic digester

For the example of generating biogas in an anaerobic digester on a pig farm, four stages of the product life cycle were reviewed:



Stage 1: The IPPC Directive applies to farms above a certain capacity, measured in pig numbers; the threshold is outlined below. This requires farm managers to consider waste and livestock management in terms of its ability to pollute waterways, soil and air. Any action required depends partly on the location of the farm in question.

Stage 2: In addition to the relevant clauses of the IPPC Directive, there are a number of Articles in the **Nitrates Directive**²⁵ relating to storage and handling of pig slurry. In cases where pig slurry is managed in close proximity to bodies of water, the requirements of the Water Framework Directive may have to be considered.

Stage 3: CAP Pillar II mechanisms provide support for capital investments on farm or as part of local renewable energy initiatives, including providing grant aid for the installation of anaerobic digesters (identical mechanisms to support for wood pellet combustion mentioned above). The IPPC Directive

²⁴ Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC.

²⁵ Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources.

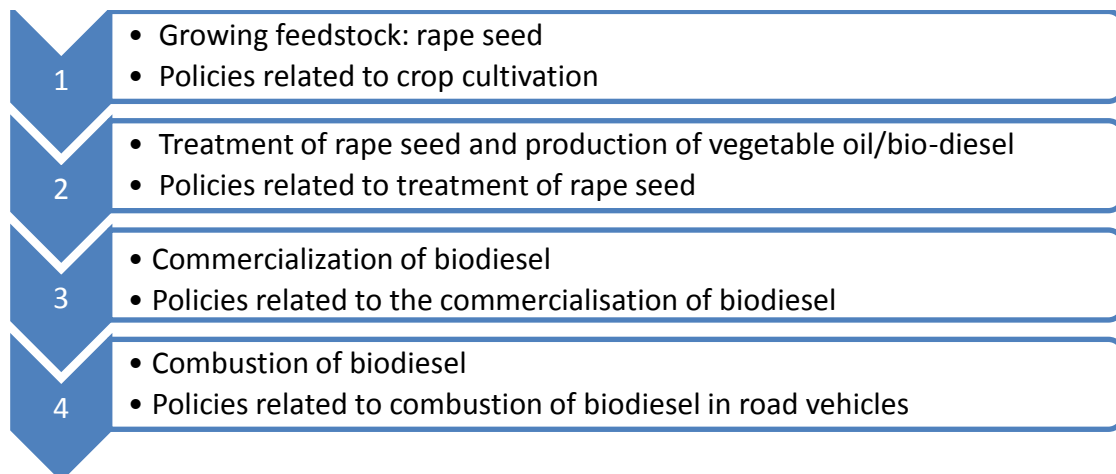
BIOMASS FUTURES

regulates the operation of anaerobic digesters above a capacity of 100 tonnes per day. It is also important to note that where a pig farm regulated under IPPC has a biogas on the same site, but below the 100 tonne capacity, it will still be regulated under IPPC as the biogas plant is considered to be a 'directly associated activity' under IPPC. CAP Pillar II funding is not likely to cover the total capital cost associated with the implementation of a digester. Obtaining revenue in the form of feed-in tariffs under national feed-in schemes for electricity from biogas fed into the national grid is very likely to be a prerequisite for running a digester profitably.

Stage 4: According to the conceptual policy map Figure A2 in the appendix, the anaerobic digestion of pig slurry generates biogas which can be utilized in two ways. Biogas could either enter the natural gas distribution system directly, or it could be used directly on the farm, for example to fire turbines that generate (renewable) electricity. In the latter example, this energy probably would then be fed in to the national energy grid. In terms of applicable EU legislation in both cases, a number of Articles in the RED would apply. Both Article 15 "Guarantees of origin of electricity, heating and cooling produced from renewable energy sources" and Article 16 "Access to and operation of the grids" apply (next to the RED being an overall demand driver).

4.4 Biofuels: The example of biodiesel from rapeseed oil

For the use of biodiesel from vegetable oil in transportation, four stages of the product life cycle were reviewed:



Stage 1: In relation to feedstocks, policy mechanisms relating to the environmental impacts of cultivating feedstocks are relevant. These could be incentives, for instance in the form of agri-environment schemes which would incorporate environmental management options into the cropped area. Other policy mechanisms might influence how and where feedstocks are grown; these might include provisions on environmental impacts related to the Nitrates Directive, to irrigation and to other pollutants (Water Framework Directive), to the Habitats and Birds Directives. Note that the energy crop premium was abolished under the 2008 Health Check reform of the CAP. Also note that most CAP payments are decoupled from production. Pillar I payments are area payments that do not depend on the use of the area and therefore do not constitute any incentives or disincentives to grow one crop or the other. The only incentives that exist in some MSs are Pillar II grants for the establishment costs of some advanced energy feedstocks (that are not used for food production) such as miscanthus (farm modernisation measures) and willow (afforestation measures); but not for crops such as rape seed that serve food purposes as well.

BIOMASS FUTURES

Stage 2: Concerning the conversion process of rapeseed to biodiesel, the provisions of the IPPC Directive do not apply. The quality of biodiesel produced is regulated by the Fuel Quality Directive²⁶.

Stage 3: No European policies have been identified related to the commercialisation of biodiesel.

Stage 4: At the point of combustion, the reduction in lifecycle GHG emissions of biofuels as compared to fossil fuels, is relevant to whether use of the fuel counts towards the target of the Fuel Quality Directive, which obliges energy suppliers to reduce lifecycle GHG emissions per unit of energy from fuel and energy supplied by at least 6% by the end of 2020 (compared to a 2010).²⁷

4.5 Review of legislation

While there are some policies and legislative acts that are unique to the various product stages of the three examples, there are a number of them that are applicable to a number of stages. The applicability of these measures is summarised in Table 1.

Table 1. Summary of relevant legislation

Example 1: SOLID BIOMASS	
Stage 1	CAP, EIA, EU Forest Action Plan, Water Framework Directive, Habitats Directive, Birds Directive, Waste Framework Directive, Landfill Directive, EU-ETS, IPPC
Stage 2	CEN/TC 335 biomass standards for solid biofuels (under development)
Stage 3	-
Stage 4	IPPC, EU-ETS, Combined Heat and Power Directive, Energy Performance in Buildings, CAP, RED as overall driver
Example 2: BIOGAS	
Stage 1	IPPC
Stage 2	Nitrates Directive, IPPC, Water Framework Directive
Stage 3	CAP
Stage 4	RED specific articles and as overall driver
Example 3: BIOLIQUID	
Stage 1	CAP decoupled payments, Nitrates, Water Framework, Birds and Habitats Directives
Stage 2	Fuel Quality Directive
Stage 3	-
Stage 4	Fuel Quality Directive; RED as overall driver

A few policies are described in further detail below. Emphasis is on the IPPC Directive, the EU-ETS and the CAP. It is not straightforward how their respective provisions relate to bioenergy development.

²⁶ Directive 2009/30/EC of the European Parliament and of the Council of 23 April 2009 amending Directive 98/70/EC as regards the specification of petrol, diesel and gas-oil and introducing a mechanism to monitor and reduce greenhouse gas emissions.

²⁷ See Skinner and Kretschmer (2010) for a detailed analysis of the interaction of the Renewable Energy Directive and the Fuel Quality Directive.

BIOMASS FUTURES

The underlying aim of the **IPPC Directive** is to promote an integrated approach to the reduction of pollution. This is, however, applicable at the plant level, and while it would not be a consideration for the entire life cycle of bioenergy products, it could be relevant for different stages of the project cycle in the three examples described. The IPPC Directive is only applicable to those activities outlined in Annex I of the Directive. This is reflected in relation to the different stages for the three examples outlined above. More specifically, the Directive applies as follows:

- 1) With respect to the first example, the IPPC Directive would be applicable to activities producing the wood waste used as feedstock for the wood pellets if this is undertaken by the pulp and paper industry.
- 2) With respect to the second example, the IPPC Directive would be applicable to pig farms with more than “2,000 places for production pigs (over 30 kg)” (Annex I, 6.6(b)), or “750 places for sows” (Annex I, 6.6(c)) and to separate biogas plants with a capacity of 100 tonnes per day.

Although the EU-ETS does not figure prominently among the applicable Directives listed above, it could have increasing interaction with the facilities covered by the IPPC that are relevant to bioenergy with increasing expansion of the scheme to encompass a greater volume of emissions reductions. At the current time, the **EU-ETS Directive** is relevant for stages 2 and 4 of Example 1 (solid biomass). In stage 2, plants generating wood waste for pellets would need to comply with greenhouse gas reductions as applied to “Industrial plants for the production of (a) pulp from timber or other fibrous materials, (b) paper and board with a production capacity exceeding 20 tonnes per day” (Annex I). In Stage 4, the Directive could apply to the combustion of wood pellets in industrial boilers. As outlined therein, it could apply to “Combustion installations with a rated thermal input exceeding 20 MW (except hazardous or municipal waste installations)” (Annex I).

The inter-linkages between the **Common Agricultural Policy** and bioenergy development can be described as follows: Pillar II of the CAP (Rural Development Policy) can support the production of bioenergy in the following ways²⁸:

- Provisions for incentivising the environmental management of agricultural land, i.e. agri-environment schemes, that can be used to integrate environmental management on land used to grow an energy feedstock
- Farm modernisation measure: investments in renewable energy infrastructure for on farm use (such as AD, wood chip/pellet combustor) and establishment costs for *perennial* energy crops such as miscanthus/Short Rotation Coppice etc.
- Cooperation for development of new products: used in many Rural Development Programmes (RDPs) for renewable energy production
- Afforestation measures (for agricultural land and non-agricultural land): establishment costs for forestry that can then be used for biomass, i.e. SRC
- Basic services for the economy and rural population / diversification into non-agricultural activities / support business creation measures: 3 measures that can be used to support investments in rural areas to improve the production of renewable energy in rural areas/local communities

In addition, Pillar I provides support for agricultural land in the form of decoupled direct payments. These are based on a per hectare basis and are not related to production – all land is eligible as long as it is kept in ‘Good Agricultural and Environmental Condition’ (GAEC). Receipt of payment is conditional on adherence to a suite of EU legislation and nationally determined GAEC standards (the mechanism called cross-compliance).

²⁸ Also see the following report regarding the use of CAP Pillar II measures (forestry related) for bioenergy: “Report on the implementation of forestry measures under the rural development regulation 1698/2005 for the period 2007-2013”, March 2009, European Commission DG AGRI, http://ec.europa.eu/agriculture/fore/publi/forestry_rurdev_2007_2013_en.pdf.

The **EU Forest Action Plan** sets out a total of 18 key actions which the Commission has proposed to jointly implement with Member States. The Action Plan, which is intended to last for five years (2007–2011) is accompanied by a longer annex that justifies the choice of actions and outlines their expected impacts. The key actions are structured around four main objectives:

- Improving long-term competitiveness (five actions), by *inter alia* encouraging innovation and research or promoting the uses of forest biomass for energy generation.
- Improving and protecting the environment (four actions); by *inter alia* improving the European forest monitoring system, developing afforestation guidelines or promoting the implementation of Natura 2000 and of agro-forestry systems.
- Contributing to quality of life (three actions); by *inter alia* underlining the importance of maintaining and enhancing the protective functions of forests or improving environmental information and education.
- Fostering coordination and communication in Member States and the Commission (six actions), by *inter alia* encouraging the use of wood and other forest products from sustainably managed forests or strengthen the EU profile in international forest-related processes.

The **Water Framework Directive** applies to surface freshwater, groundwater and coastal marine waters. The WFD requires Member States to prevent deterioration of ecological quality and pollution of surface waters and restore polluted waters, in order to achieve good ecological status in all surface waters. The management unit is the River Basin Management Plan, within which Member States must establish programmes of measures to meet the environmental objectives of water bodies. The Directive divides such measures into 'basic' and 'supplementary'. Basic measures include, *inter alia*, those that are required already under Community law (such as the requirement of the Nitrates and IPPC Directives). Supplementary measures are any additional requirements necessary to meet the WFD objectives. These may include actions to be taken regarding any aspects of bioenergy production that has negative consequences for water that is not already addressed by other EU law.

5 Conclusions

The identification of the policy linkages elaborated above revealed the following issues and future challenges:

- In an effort to reduce GHG emissions from agricultural activity and LULUCF (land use, land use change and forestry), the coming years could see the adoption of novel legislation to account for and regulate emissions from these sectors. This would impact bioenergy production chains that rely both on forestry and agricultural feedstocks.²⁹
- With increased exploitation of waste resources for energy purposes, a number of these waste-based feedstocks need to be reclassified in policy terms as commodities and are no longer waste products. This opens up a new set of questions in terms of how they may be treated as part of trade agreements given that they in fact become tradable commodities.
- The discussion of various pieces of legislation illustrates that there is an increasing tension between the growth of the bioenergy sector in response to legislative drivers, and the protection of biodiversity, also partly driven by EU legislation, particularly the Birds and Habitats Directives. This relates to certain commercial applications of the technology.

²⁹ Note in this context that the European Commission recently has finished conducting a public consultation on the role of EU agriculture and forestry in achieving the EU's climate change commitments referring to LULUCF (land use, land use change and forestry) activities: http://ec.europa.eu/clima/consultations/0003/index_en.htm.

BIOMASS FUTURES

- To what extent will adaptation to climate change impact the bioenergy sector? In this context one should note the possibility that new types of crops may be planted in Europe in reaction to changing climatic conditions. Impact assessments should accompany their introduction on any scale to determine how alien species could impact biodiversity.

Besides these future challenges identified as a consequence of the policy mapping exercise, the first part of the report has highlighted the importance of the coming months and years for meeting bioenergy requirements. Making sure that these are met in a sustainable way is the key challenge. Firstly, because bioenergy is seen as a solution to environmental risks such as climate change. And secondly, because the successful implementation of the RED's sustainability scheme can be a powerful example and precedent for sustainable supply chains in a wider range of agricultural sectors.

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APPENDIX

Appendix 1 – Conceptual Policy Maps

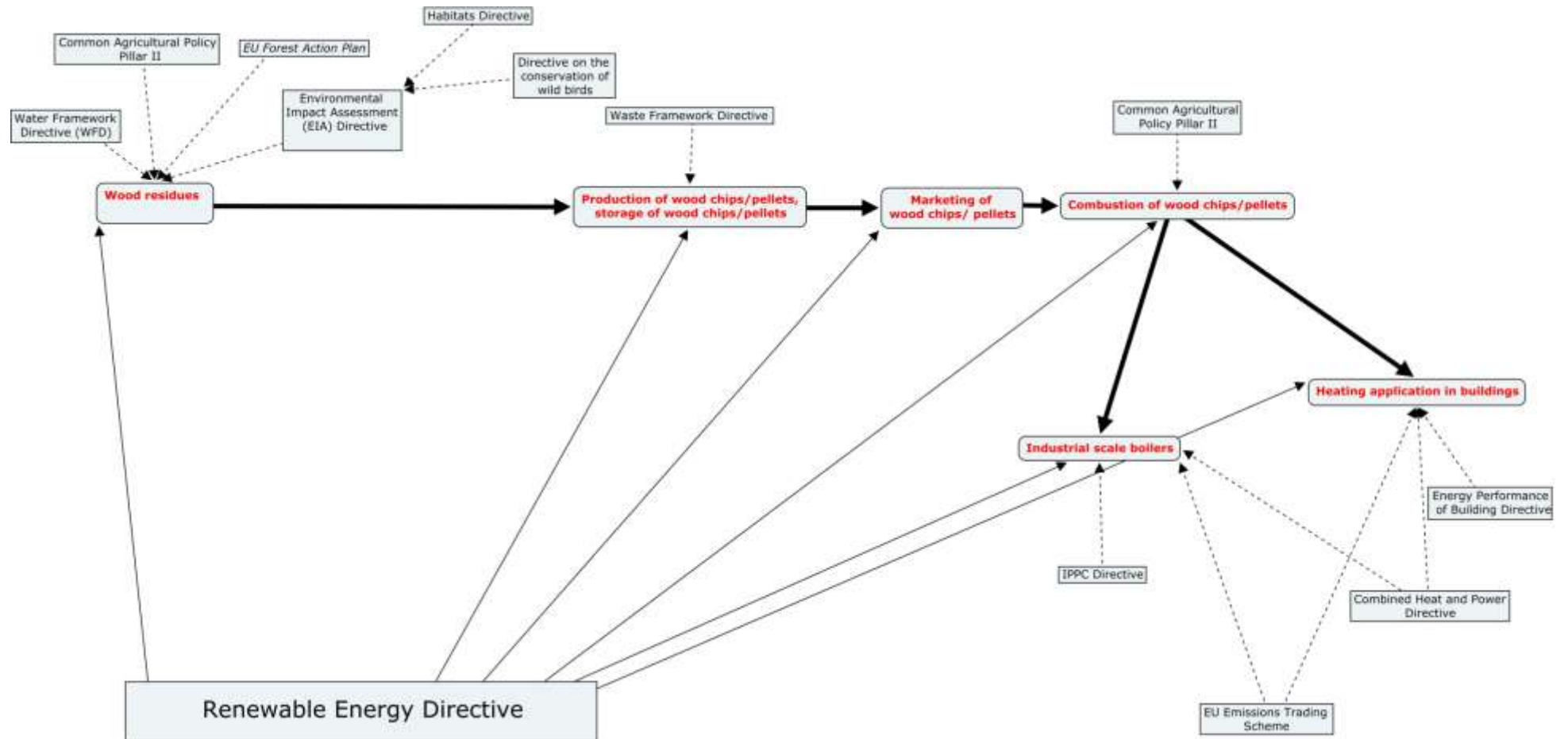


Figure A1. Conceptual policy map for wood pellets as an example of solid biomass

BIOMASS FUTURES

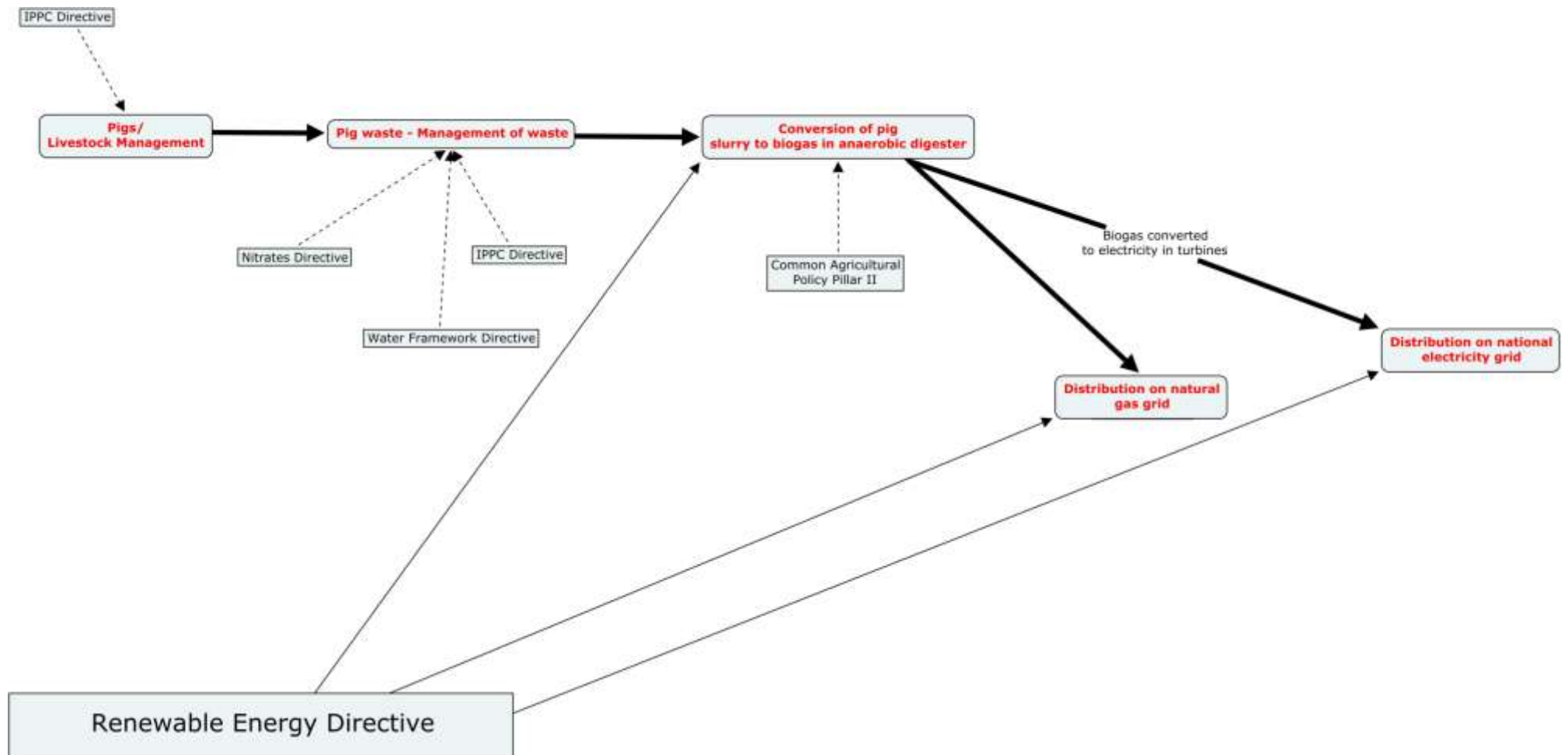


Figure A2. Conceptual policy map for biogas based on pig slurry

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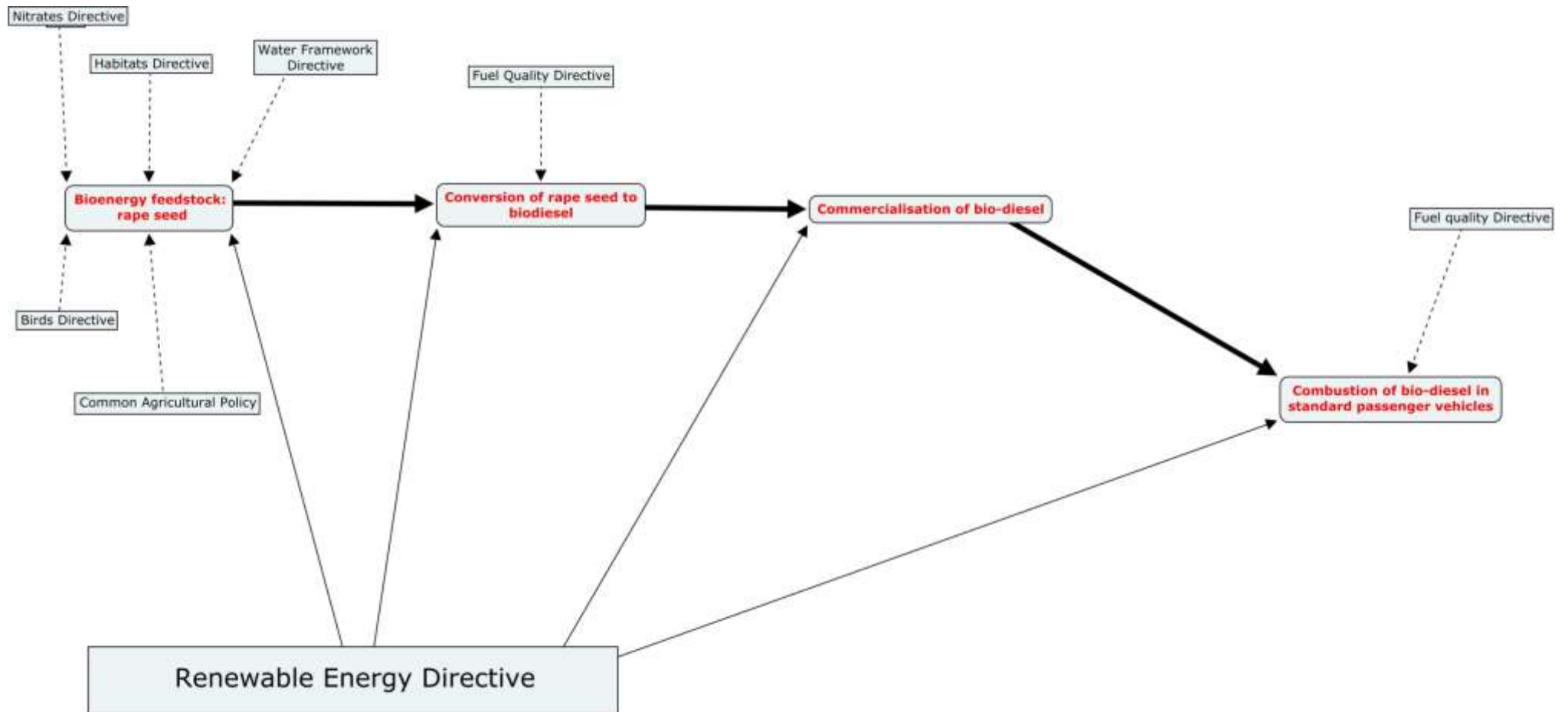


Figure A3. Conceptual policy map for biodiesel based on rapeseed oil