

Options for Designing the Political Framework of the European Bio-based Economy

Including statement on the recent ILUC reform proposal and a list of market pull measures for bio-based products

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Options for Designing a New Political Framework of the European Bio-based Economy

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1 Executive Summary

The current framework of the European bioeconomy creates a non-level playing field between the material use of biomass and the energy use of biomass, clearly disfavours the material applications, also called “bio-based products”. This is short-sighted and prevents the European bioeconomy from tapping into its full potential, since bio-based products can contribute to:

- Innovation & competitiveness;
- Investments, employment, value added;
- Cascading use, resource efficiency & Circular Economy;
- Independence from imports of raw materials;
- Short- and long-term positive climate effects, decarbonisation of the economy;
- Positive environmental impacts, reduction of waste pollution e.g. through biodegradable microparticles of plastics
- Consumer well-being.

The policy framework needs to be modified in order to enable the bioeconomy to make these positive contributions to the European society and economy. While a multitude of policy documents already acknowledge the potential of the bioeconomy and also that there is currently no level playing field between the different uses of biomass, concrete implementation of any measures that would change this situation is sorely lacking. This is, among other things, especially true for the cascading use of biomass: with bio-based products as its starting point, it increases resource efficiency as well as the sustainable use and generation of value added from biomass and it is part of the circular economy. Bio-based products and cascading use are an indispensable part of any resource efficiency and sustainability strategy. One is not conceivable without the other.

The paper highlights the weakest points of the current framework and why it needs to be changed. It argues that at the moment there is an artificially created strong market pull for bioenergy and biofuels only; in order to even the scales, market pull is also needed for bio-based products. The paper then identifies and discusses different options of push and pull instruments, evaluates their feasibility and expected impacts and in conclusion draws recommendations for further steps.

It is stressed that cross-functional cooperation between policy makers is needed in order to obtain a holistic perspective and policy neutrality. The ideal framework would ensure a balance of push and pull mechanisms that are based on long-term goals and allow for the best technology and application to flourish. This would also create a positive image of the bioeconomy, since end consumers and society would be able to benefit from the shift.

In terms of market pull measures, it is recommended that the current infrastructure of bioenergy and biofuels is transformed in order to produce more high-value chemicals and materials. This could be achieved by opening the energy quotas to also be fulfilled

with materials made from biomass and by actively supporting the transformation of production plants. It is further recommended that smart market mandates are used in order to promote environmentally friendly, bio-based innovation by favouring those bio-based products that offer true solutions to ecological and societal challenges; that R&D is kept open to all types of biomass and applications (rather than limiting them to second-generation feedstocks only); and that supply security of high-value industries is ensured.

2 Introduction

The European Union will need a new political framework for rolling out its bio-based economy by 2020 at the latest. The existing framework does not create sufficient market pull for implementing innovative, bio-based technologies. The best framework would allow for the highest resource efficiency, the most innovation capacity, the highest value added, the most employment and the greatest climate protection. The current framework creates a non-level playing field between bio-based materials and energy and ultimately prevents Europe’s bio-based economy from tapping into its full potential of innovation, investment and jobs. There are several ways to change this framework.

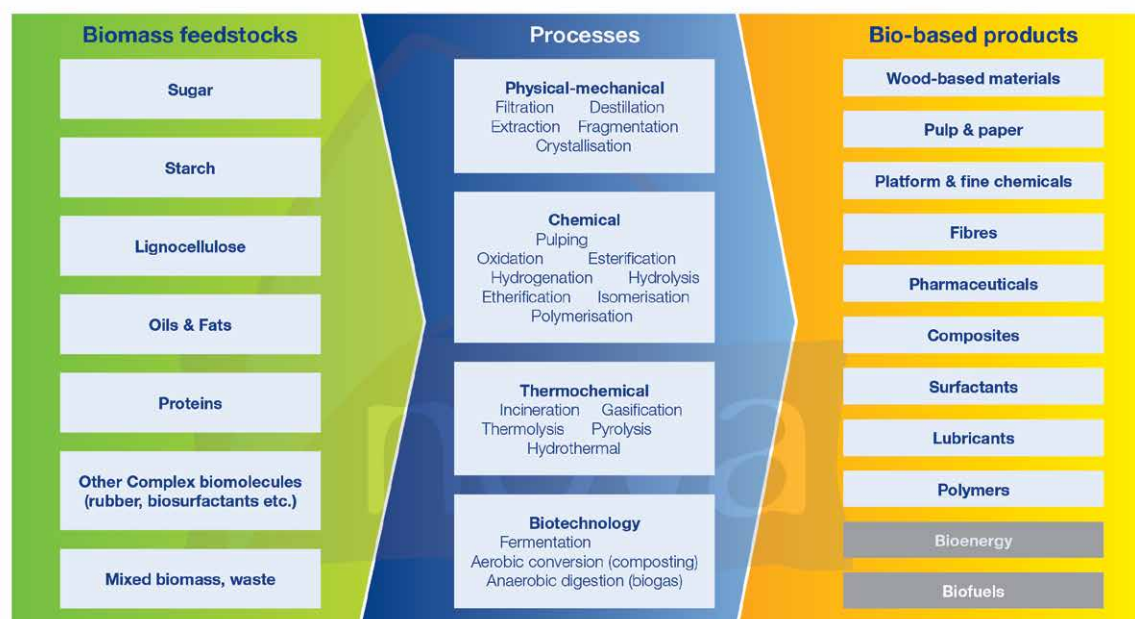
Furthermore, the EU is currently questioning heavily the existing support system for bioenergy and biofuels and its future after 2020. Many member states of the EU are behind on meeting the targets set out in the “Renewable Energy Directive (RED)” and investments are stagnating. Political and public debates focus more on the effects on global food prices, pressure on ecosystems, and direct as well as indirect land-use change, rather than on growth and future opportunities and investments.

Another issue becoming more and more urgent is Europe’s competitiveness in a changing world economy. Europe’s industry has to deal with relatively high resource, energy and labour prices that make production more expensive than in other parts of the world. This also applies to biomass, which is artificially made more expensive through the energy incentive system and import duties for agricultural resources. In its communication “For a European Industrial Renaissance”, the European Commission stresses the importance of the European manufacturing industry and of bio-based products in this context, also underlining the necessity to provide access to biomass at competitive prices (COM (2014) 14 final). Current estimations, however, project very negative developments of the European bio-based economy: Europe’s share of worldwide bio-based chemicals and material production is expected to drop from 37 % in 2005 to 14% in 2017 (Van der Hoeven 2014), while its share of polymer production might even go down from 17% in 2013 to less than 8% by 2018 (European Bioplastics 2014).

Within the discussions about increased resource efficiency and the Circular Economy Package, bio-based products should play a greater role, since they could make valuable contributions to the declared goals of the Commission communication on the Circular Economy (COM (2014) 398) and even to the much broader Europe 2020 Strategy (COM (2010) 2020). Especially if the cascading principle¹ is applied, it will strengthen the efficient use of bio-based resources in the European Union and would make more biomass available with even less market intervention than what the RED causes today. Cascading use is currently a controversial discussion point in the political arena (Carus, Dammer & Essel 2015) and despite several commitments to the principle in various policy documents (European Commission 2012, COM (2014) 14 final, European Parliament 2013), there is no concrete

¹ Cascading use: Subsequently transforming biomass into several products, going from a first bio-based product via several recycling steps to additional applications, substituting several petrochemical products, with energy usage only at the end of the life cycle.

Bio-based Economy: feedstocks, processes and products (without food & feed)



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Figure 1: Bio-based Economy: feedstocks, processes and products (without food & feed) (nova 2015)

political support for the actual implementation yet.

Seeing all this, it makes less and less sense that the current framework focuses only on the energy sector in terms of market instruments. Bio-based products can even contribute to the goals of the Energy Union Package – more independence from imports of resources and the decarbonisation of our economy (COM (2015) 80 final) – since an increased renewable feedstock basis for the chemical industry would also result in less pressure on imports of oil and gas and a reduced CO₂ footprint of the industry. In the right political framework, modern biorefineries can provide bio-based chemicals and materials as well as biofuels, thus fulfilling several objectives in one step.

Bio-based chemicals and materials can create much more added value per tonnes of biomass, innovation, employment and investment and – if done right – can contribute to an economically and ecologically viable future of the European Union. However, so far they are only considered in research policies without any widespread commercial implementation.

This is also confirmed by the Organisation for Economic Co-operation and Development: “Generally, biofuels policy support is much greater than it is for either bio-based plastics or bio-based chemicals. This is likely to make the development of the bioeconomy uneven, and may disfavour the use of biomass for bioplastics and bio-based chemicals. It may also constrain the development and operation of integrated biorefineries” (OECD 2013).

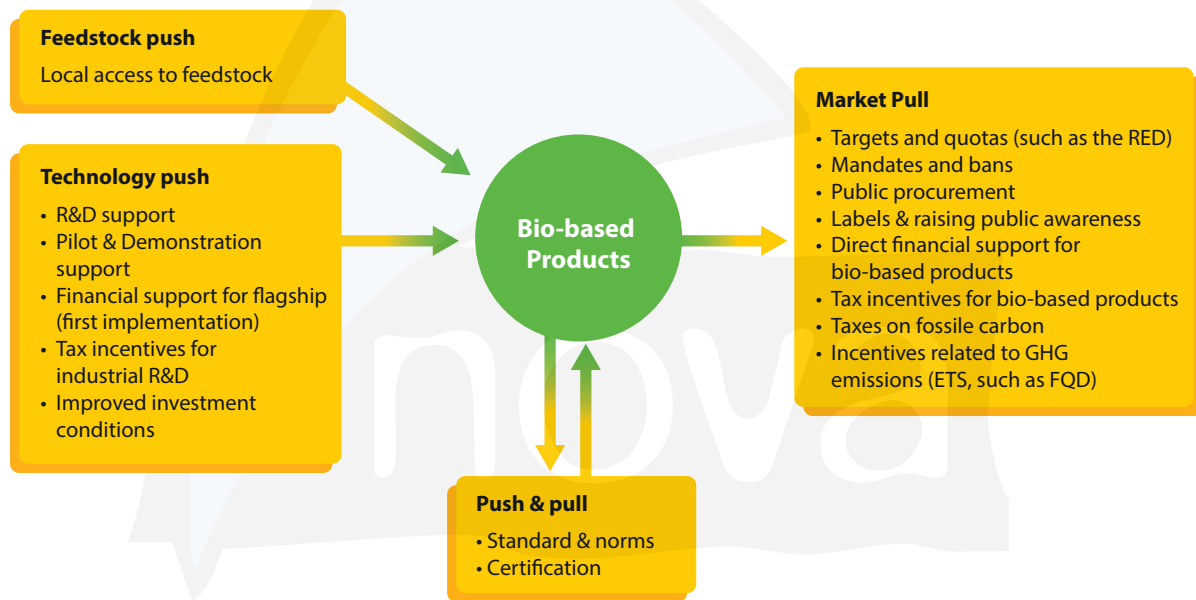
3 It is Time for a Change and a New Start

The on-going political debates about the energy framework after 2020 (COM (2014) 15), but also about the Circular Economy Package, which was retracted in 2014 and will be replaced with more ambitious goals in 2015, mean that there are now real opportunities to improve political and market conditions for bio-based products. Knowing that past decisions have had more of an impact than just what was desired, should not lead to a stand-still, but to openness for new ideas.

Of course, the number of ways to reform the existing political framework is limited. The main possible instruments are shown in Figure 2, which follows Joseph Schumpeter’s theories of technology push and market pull factors. A technology push implies that a new invention is pushed onto the market through research and development (R&D), production and sales functions, without properly considering whether or not it satisfies a user need. In contrast, an innovation based on market pull has been developed by the R&D function in response to an identified – possibly artificially created – market need (Martin 1994).

With this position paper, nova-Institute’s policy experts contribute to the current debate by assessing and evaluating different options for framework reform.

Instruments to strengthen innovation implementation by technology push and market pull (nova 2014)



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Note: RED Renewable Energy Directive | GHG Greenhouse gas | ETS Emission Trading System | FQD Fuel Quality Directive

Figure 2: Instruments to strengthen innovation implementation by technology push and market pull (nova 2014)

4 Feedstock Push

From the “push” perspective, most assessments come to the same conclusions about what needs to be done. A bio-based economy can only flourish when local access to feedstock at a reasonable price can be guaranteed – otherwise all investment will be limited to a few harbours, where biomass can be imported from other countries.

Biomass is not rare in the EU, but allocating it properly has its issues. Mainly because of the existing incentives of the Renewable Energy Directive, a number of biomass sources are only accessible for bioenergy and biofuels, but not for bio-based chemicals and materials. This directly contradicts the promised “policy neutrality in access to biomass for different purposes” (COM (2014) 14 final) and needs to be addressed, e.g. by changing market pull mechanisms (see below).

General availability is however also influenced by agricultural policy and by the import regime. Here, the Commission (DG AGRI) and the regions via the “European Agricultural Fund for Rural Development (EAFRD)” could play a more active role by creating the suitable framework conditions so that sustainable feedstock can be provided at a competitive price, by supporting mobilization of additional biomass from agriculture and forest, better utilization of sidestreams and by-products and by implementing suitable indicators and monitoring systems.

The last reforms of the Common Agricultural Policy (CAP) will already result in a change of biomass supply in the future. “In 2017, after the abandonment of sugar quota, we will have lots of cheap sugar in Europe. Europe is the most efficient producer of sugar in the world, in Northern France, Flanders, and Southwest Holland. Sugar,

a first generation feedstock, is one of the most sustainable resources, easily and cheaply fermentable” (Carrez 2014). These findings are also supported by a recent study investigating the competitiveness of the European sugar beet compared to other sugar feedstocks around the world that comes to the conclusions that European sugar beet is very land efficient and competitive (Deloitte 2014). It will therefore be of crucial importance that the bio-based chemical and material industries have access to European sugar. The latest analyses also question the preference of lignocellulosic feedstock in general (Carus & Dammer 2013).

Another important aspect is the mobilisation of wood resources in Europe, where forests show more growth than extraction, with especially small private forests systematically being underutilized (Mantau et al. 2010). A development towards cascading use and an ultimately circular economy would contribute to a wider availability of wood resources for all sectors.

5 Technology Push

Concerning technology push, the European Union has always been competitive and has at times been at the forefront of research and development. The new programmes, such as Horizon 2020, develop the R&D framework further and also address more market and business oriented factors. This seems like a suitable way to help newly developed processes and products achieve market success.

The support of pilot- and demonstration plants as well as the financial support of flagship investments (all weak points in the past) are covered by the new cooperation between the European Commission and the Bio-based Industries Consortium (BIC): The Bio-Based Industries

Joint Undertaking launched its first Call for Proposals in summer 2014 (<http://biconsortium.eu/call-2014>). €3.7 billion will be made available to realize the potential of bio-based industries in Europe.

In the future, the range of R&D activities should be carefully chosen and should not be limited to the conversion of lignocellulosic feedstocks, waste biomass and algae; research should also be done on the use of sugar beet in the chemical and plastics industries, the use of rapeseed oil in oleochemistry, and biomethane as well as high value extracted components for the production of chemicals and polymers. Moreover, the large demand for cellulose fibre in textiles should not be ignored; it could be a great opportunity to transform the European pulp industry.

Finally, access to finance is extremely important in enabling technological developments, especially for bringing them to pilot stages. Unfortunately, the investment climate in Europe is weak compared with many locations in America and Asia. Unfavourable conditions for new investments (incl. market distortions that only favour the energy sector and increase feedstock prices), high energy and labour prices, lacking infrastructure, insecure supply of biomass and other factors hamper the flow of capital for the bio-based economy (Dammer & Carus 2014). What can Europe learn from other regions in the world? Tax incentives for industrial R&D could be helpful to strengthen market oriented research and development outside the official EU and member states' programmes. One idea would be to create a dedicated task-force within the European Investment Bank (EIB) to facilitate access to finance for the bio-based economy, e.g. through less complex and shorter procedures for identified priority projects. In the Energy Union Package (COM (2015) 80 final), it is envisaged that the future European Fund for Strategic Investments should be used as a new funding instrument for major infrastructure projects. According to John Bell, Director of the Bioeconomy Directorate in DG RTD, this fund will not only be open for energy projects, but also for important strategic projects that will promote the bio-based economy in general (Il Bioeconomista 2015).

6 Push & Pull

Standards and certification can be understood as both push or pull instruments. DG Growth (previously DG Enterprise and Industry) with its "Commission Expert Group for Bio-based Products" focuses on standards and certification, as well as on market pull measures such as labelling, public awareness and public procurement for bio-based products.

Triggered by DG Growth, the European Committee for Standardization (CEN) made substantial progress on bio-based products over the last years. A dedicated technical committee (TC 411) deals with them and in August 2014 the European Standard EN 16575 on "Bio-based products – Vocabulary" came into force. This standard defines a bio-based product as a product which is "wholly or partly derived from biomass. ... The bio-based product is normally characterised by the bio-based carbon content or the bio-based content. For the determination and declaration of the bio-based content and the bio-based carbon content, see the relevant standards of CEN/TC 411." It is expected that in 2015 and 2016 CEN/TC 411 will finalize the standards on determination of bio-based content, on sustainability of biomass feedstocks and on B2B and B2C communication.

The certification of "sustainable feedstock" is also on the right track: established systems such as ISCC, RSB, FSC, PEFC and others can be used wherever it is appropriate.

All above-mentioned activities are important for establishing a long-term market of bio-based chemicals, materials and products. However they barely help in the everyday competition for biomass and market access, and are relatively weak instruments which are not enough to trigger large-scale effects and investment.

7 Market Pull

In contrast to the above-mentioned measures, making bio-based materials and products economically attractive or even mandatory for the industry or end consumers would be a strong market instrument. That attractiveness can be reached by implementing different kinds of market pull instruments, and history shows that such market interventions can make a real, positive difference: Renewable energies, the LED revolution and energy-efficient products are all relatively recent examples that profited substantially from legislative measures and brought actual advantages to end consumers and society.

nova-Institute discusses the following as strong market pull instruments: targets and quotas; mandates and bans; direct financial support; tax incentives; and the EU Emissions Trading System (ETS). All possible options will be described briefly and evaluated below. Furthermore, we will discuss the "no market pull at all" option.

Targets and Quotas

Today's most important market pull instrument in the bio-based sector is the Renewable Energy Directive (RED), which creates artificial demand for bioenergy and biofuels. In terms of investment and market volume, this has been very successful. However, several problems of the current framework have started to become apparent over the last few years: many member states are not on track with meeting their quotas; discussions persist about the pressure on ecosystems and the resulting problems of biodiversity loss or (indirect) land use change (LUC and ILUC); certification of sustainable feedstocks is only part of the answer; the system of multiple counting for certain feedstocks remains an issue, as well as their classifications as waste, residue or co-product and feedstock bottlenecks have appeared due to the increased and unbalanced demand for biomass. Moreover, the existing RED framework does not take resource efficiency, cascading use and circular economy into account.

At the same time, the high-value bio-based economy is not picking up any speed. This is caused, among other things, by the framework conditions created by the RED, which systematically prevent new developments and investments in higher value added applications, such as bio-based chemicals and materials, by only supporting energy use of biomass. The reform compromise of the RED that was triggered by the ILUC controversy and which was agreed on by the European Parliament in April 2015 will probably have some positive, but also continued and exacerbated negative impacts on the material use. (See the evaluation of the reform and its impacts on the material sector in Annex I.)

Several political players question the planned increase of the renewable energy quota by 2030 and would prefer to avoid technological obligations. The current mood in many member states as well as the European Commission seems to favour the option to discontinue the existing RED framework after 2020, or only for second-generation biofuels. Directing the market by "targets and quotas" is more questionable than ever and if this strong instrument is to survive after 2020, it will have to be substantially modified. Another currently realistic option would be that all member states would be free to establish quotas or not; this would result in a patchwork of quota systems all over Europe where some countries would prefer using bio-based chemicals and materials immediately while others would continue to use the existing energy and fuel quotas.

In 2014, nova-Institute published the “Proposals for a Reform of the Renewable Energy Directive to a Renewable Energy and Materials Directive (REMD) – Going to the next level: Integration of bio-based chemicals and materials in the incentive scheme” (Carus et al. 2014). The reform proposal is aimed at creating a level playing field for bio-based chemicals and materials with bioenergy and biofuels in Europe by opening up the renewable energy quota to include chemicals and materials produced with renewable feedstocks. The basic idea is to account for material use of a chemical building block such as bioethanol or biomethane the same way it would be accounted for in case of energy usage. Other building blocks could be included by converting them into bioethanol equivalents based on their calorific value or GHG emission reduction. The reform proposal aims to allow for the most value added and the highest reductions of greenhouse gas (GHG) emissions with a limited amount of biomass while preserving and transforming the existing infrastructures of bioenergy and biofuels.

In the context of keeping modified quotas after 2020, it could be a feasible possibility to significantly cap the quotas for bioenergy and biofuels from agricultural land (similar to the recent decision in the ILUC compromise, but with a stronger reduction focused on agricultural land (not 1st or 2nd generation) and applicable to all forms of bioenergy and not only biofuels), while keeping the feedstock choice more open for bio-based materials and chemicals. This is due to the fact that many chemicals require much more specific feedstocks than energy does, but also because the overall volume of bio-based chemicals and materials is much smaller than energy and because many material pathways utilize biomass with a significantly higher efficiency (higher shares of the biomass end up in the final product).

Advantages of a RED reform – keeping targets and quotas

- No sudden ending of subsidies, but a continuous development of the bio-based economy, including bio-based chemicals and materials;
- Possibility to fulfil the existing CO₂ reduction targets and even increase binding targets beyond 2020 as originally planned, because it would be possible to fulfil them in more ways than today.

Disadvantages of a RED reform – keeping targets and quotas

- Complicated implementation of detailed instructions and further difficulties in avoiding unwanted market distortions in the future;
- Long-term higher energy and fuel costs for consumers, possibly also for bio-based products.

Biotickets for Chemicals and Materials?

Even though aviation fuels are not included in the RED (just like bio-based chemicals and materials), it is theoretically possible to count them towards the renewable fuel quota. The Netherlands is the only country that have developed and implemented a regulation for this, via so-called “biotickets”. The system has been approved by the European Commission and is practiced. Producers of biokerosene get awarded these biotickets through the Ministry of Economic Affairs, which they can sell to road transport fuel producers. In turn, these producers can then use the tickets to fulfil their renewables quota – instead of using biofuels. If the biokerosene producer can show that the kerosene was produced from second generation feedstocks, the bioticket can also be counted double for the fuel quota.

This relatively simple idea could be a feasible way to also count bio-based chemicals and materials towards the renewable energy

Mandates and Bans

Mandates and bans can successfully exert targeted influence on markets. A recent example is the ban on the highly inefficient light bulbs, which has significantly contributed to accelerating the light emitting diode (LED) revolution. Today, there are LEDs for almost any light application, which has caused a strong increase in energy efficiency, lower market prices for end consumers and even new investments in European production.

There are similar opportunities for bio-based products that offer considerable ecological and health advantages for many applications. So far, however, most of these opportunities have been left unused, with the exception of the planned ban on single-use plastic bags being discussed in the EU.

The reasons for mandates and bans should always be based in environmental and health protection, not in the property of being “bio-based”. Such advantages exist for example in the cases of bio-based, biodegradable mulching films for agriculture, or biodegradable microplastics in body care products. Both applications would serve to avoid significant amounts of plastic pollution in the environment. Another environmentally friendly legislation could entail preferring bio-based durable plastics that have a lower CO₂ footprint than conventional ones.

However, these ecological reasons can and should be complemented by the political will to contribute to a long-term, future-oriented resource shift away from petrochemicals. This means for example that the properties biodegradation and bio-based should be strongly linked (although some fossil-based products can also be biodegradable). Together with several experts, nova-Institute has compiled a list with specific suggestions for mandates and bans and put it forward for discussion (see Annex II). It is fascinating to see how many of the proposed measures would make sense in terms of environmental and health policy and which application ranges would be covered by them.

This approach could also (finally) rouse some much needed interest for the bio-based economy and bio-based products in the Environmental Ministries of the member states. With a view on bioenergy and biofuels, some officials have always been sceptical, but if bio-based chemicals and materials offer true environmental advantages, the Ministries of the Environment should become more active in the discussions and the processes of the bio-based economy. Furthermore, a policy approach based on solutions for ecological and social challenges can substantially improve the image of the bioeconomy. Currently many end consumers, as well as NGOs and environmental authorities, are sceptical or uninformed about bio-based products. If they could see that

quota: Producers of bio-based chemicals and materials receive the bioticket and sell it to fuels producers who can use it to fulfil their obligations. For the practical implementation, a lot can be learned from the existing Dutch system, which would avoid a great amount of bureaucratic effort.

There are some concerns that this system would force car drivers to finance aviation fuels or bio-based chemicals and materials at the gasoline station. It is important to note that the additional costs for transportation fuels are exactly the same, whether the renewable fuel quota is fulfilled by bio-based transport fuels, by aviation fuels or by bio-based chemicals and materials. Car drivers therefore have no disadvantage at all through an expanded “bioticket”. In contrast, perhaps they might even be happy to support renewable materials through this system.

these products contributed to a positive societal change and brought them tangible advantages, this could be a significant motivating factor to support the shift towards a renewable feedstock base of the European industry.

Advantages of mandates and bans

- Environmental and health reasons can be powerful political tools and can find much support from policymakers, society and NGOs; legislation based on these reasons can create a positive image for the bioeconomy because it offers real solutions for current challenges;
- Properly designed, long-lasting mandates and bans can create considerable market incentives, prompt environmentally friendly innovation and encourage investment in Europe.

Disadvantages of mandates and bans

- Mandates and bans constitute strong market interventions which are often rejected and opposed by established industries;
- Political steadfastness will be necessary in order to enforce comprehensive mandates and bans.

Public Procurement

European public authorities spend almost €2,000 billion on goods and services every year. This means that public procurement can be a tool for creating market pull, also for innovative bio-based products. The BioPreferred® program of the USDA is a very pragmatic example of how public authorities can promote bio-based products. In Europe, there is no such thing and public procurement is not yet used as a market pull instrument for bio-based products. Two existing procurement tools could principally cover bio-based products, too, but presently do so insufficiently: Green Public Procurement (GPP) and Public Procurement of Innovation (PPI). However, slowly but surely, things are being set in motion to change the current situation.

On the European level, public procurement is covered in a working group of the “Commission Expert Group for Bio-based Products” and also in a Horizon 2020 project that aims to build procurement networks for innovative bio-based products. The project is called InnProBio and started 1 March 2015. There are already a multitude of national and regional platforms that support sustainable procurement, and some of them also contain dedicated information on bio-based products. The FP7 project Open-Bio collected these product information platforms recently (www.open-bio.eu).

As mentioned above (“Push & Pull”), however, we think that public procurement, albeit an important contributing factor for market establishment of bio-based products, will only have a limited impact on the markets.

Labelling and Raising Public Awareness

Labels offer targeted information about the advantages of the labelled products in order to influence buying decisions of consumers. The discussion about supporting the market pull of bio-based products includes the introduction of a label informing consumers about the bio-based content of the products they buy. However, several methodological challenges have to be faced in order to avoid false claims (“greenwashing”) or simple misunderstandings. Discussions are on-going in the “Commission Expert Group for Bio-based Products” and in the research project Open-Bio, mostly with a focus on the EU Ecolabel (www.open-bio.eu).

Similarly to public procurement, we think that labels could play a role in the market establishment of bio-based products, but will not be enough to help in the everyday competition for feedstock and

investments. However, the positive image of a bioeconomy that offers solutions for today’s ecological and societal challenges (see above “Mandates & Bans”), could substantially be enhanced through one or several credible labels. Also, in order to receive a GreenPremium price for their bio-based products, companies need to communicate this property in a transparent and reliable way, since consumers are only willing to pay this premium if they are convinced about the advantages (Carus, Eder & Beckmann 2014). For this, labels can be a valuable tool.

Direct Financial Support

Another option is to give direct financial support for the feedstocks of certain bio-based product lines; however this somewhat successful refund system was discontinued years ago. Financial support for production and marketing of bio-based products is generally also seen as critical and is difficult to harmonize with competition law. Furthermore, it would require providing considerable direct financial means. In the long term, direct financial support is therefore not considered as a relevant tool for the future design of the framework.

However, two exceptions could be made for short- or medium-term initiatives:

- Targeted and temporary market introduction programmes for new bio-based materials;
- Support for converting old petrochemical plants into biorefineries.

Tax Incentives

Today, the worldwide chemical industry pays no taxes on the use of crude oil or natural gas as feedstock. A tax on fossil carbon used by the chemical industry would be a strong instrument to make biomass sources attractive. However, this approach can only be implemented on a global level, since considerable market distortion would otherwise result, with negative effects for Europe. As an example, Norway is currently considering implementing tax incentives for bio-based plastics – or introducing a new tax on fossil CO₂ content in polymers, which is not taxed today. Their aim is to create market pull for the bio-based economy. In December 2014, the Norwegian parliament decided to instruct the government to evaluate different options. The Ministry of Finance is supposed to receive a proposal from its directorate in May 2015 and prepare it for submission to the parliament for next year’s national budget (Gjerset 2015).

Different kinds of tax incentives for bio-based products are possible in the member states and have been investigated in different reports. In some member states this instrument was already used, for example for packaging materials (Belgium, The Netherlands). Brussels could enable member states to use tax incentives, with the responsibility for implementation falling on the member states. The current discussion about the applicability of reduced VAT for environmentally advantageous products is leaning that way.

Incentives/Regulations Related to GHG Emissions

In principle, the whole Emission Trading System (ETS) or general accounting for GHG emissions could be expanded in order to cover the material use of industrial production and not just energy use. An improved choice of materials can also reduce greenhouse gas emissions by substantial amounts. First steps in this direction are being made internationally for the wood sector in order to account for stored carbon in harvested wood products in the national inventories of EU member states and other parties of the Kyoto Protocol in the second commitment period. In May 2013, the European Parliament and the Council decided on the accounting rules for emissions and removals from Land Use, Land Use Change and Forestry (LULUCF) (529/2013/EU).

So far, no member state has made use of this reporting mechanism due to a lack of data and of a scientific basis for the method. It will be obligatory from 2015 on and very few states might have made the first steps towards implementing the mechanism already, but no publicly available information was able to confirm this. In the context of emissions trading, the certificates would have to be made much more expensive in order to gain real effects.

Another option would be imposing obligatory GHG reduction goals for specific economic sectors, such as for example the plastics industry. The targets could be reached through increased use of recycled materials, petrochemical plastics with a lower carbon footprint or especially bio-based plastics, which in most cases show a lower carbon footprint than their petro chemical counterparts (see table of suggested mandates and bans in Annex II).

No Market Pull At All

Another option which is currently under serious discussion and which has its attractions is to discontinue all incentives and support schemes for bioenergy and biofuels from 2020. This means that no more money will be spent on implementing political roadmaps to foster the bioeconomy – neither the energy use nor the material use of biomass. Instead, the market economy will regulate investment, production and distribution of biomass based on supply and demand. Six major advantages and disadvantages are listed below:

Advantages of abolishing incentives for bio-based energy

- No more political need to justify direct and indirect land use change or for certified sustainable feedstock, since the market would regulate the allocation of biomass and decide which products would be realized;
- Those bio-based products that create the highest added value will have a much better access to biomass;
- For the same reason, bio-based materials and products that can receive GreenPremium prices would be in favour (Carus, Eder & Beckmann 2014).

Disadvantages of abolishing incentives for bio-based energy

- An abrupt end of the support system endangers the majority of investments and employment in the bioenergy and biofuel sectors;
- Europe might not be able to realize its ambitious CO₂ reduction goals;
- Sustainability requirements such as the protection of primary forests or working conditions would not be covered by legislation (as it is currently implemented in the RED for biofuels) and thus not be implemented if any additional costs for the biomass are expected.

8 nova-Institute's Recommendations

For any future policy development affecting the bio-based economy, legislators need to assure that a holistic perspective is applied to protect the level playing field and that cross-functional DG commitment is secured within the European Commission. The ideal framework would ensure a balance of push and pull mechanisms that are based on long-term goals and allow for the best technology and application to flourish. In concrete terms, we recommend implementing the following measures

Keep the existing infrastructure with a substantial reform of the RED. The existing infrastructures of bioenergy and biofuels, which are already under pressure, could be in danger after 2020. The current

infrastructure is an advantage and forms the basis of the European bio-based economy. It should be used, preserved and expanded by the transformation to bio-based chemicals and materials. Most member states want to keep the existing energy support system in one way or another in order to maintain existing infrastructures and employment, but that can also be achieved by transforming it. This is an opportunity that needs to be seized. The transformation of structures is mostly relevant for the utilization of rapeseed in oleochemistry (today used in large quantities for biodiesel production) and for biogas as a feedstock for chemicals (today used in large quantities for electricity). To achieve this, nova-Institute recommends a substantial reform of the RED to a Renewable Energy and Material Directive (REMD) or the introduction of a bioticket system for bio-based chemicals and materials. By promoting new material applications of biomass, more value added can be created per tonnes of biomass, new investments attracted and employment generated.

Use mandates and bans to create environmentally friendly innovation. Mandates and bans should be used as strong instruments based on sound environmental and health reasons in order to tap the full positive potential of bio-based products. Environmental authorities and NGOs should get behind these measures and support this development in line with their own goals. That would strengthen the positive image of the bioeconomy with European end consumers, increase public support and enable companies to receive GreenPremium prices for their bio-based products. These market pull measures should be implemented in close coordination with a technological push in the form of support for R&D, pilot and demonstration plants and flagship investments.

No limitation of R&D activities to specific biomass and applications only. R&D activities should not be limited to the conversion of lignocellulosic feedstocks, waste biomass and algae. Research should also be conducted on the use of sugar beet in the chemical and plastics industry, on the use of rapeseed oil in oleochemistry and on high value extracted components of biomass. Sugar is relevant because it is expected to become cheaper after 2017; rapeseed is relevant for keeping the existing infrastructure of the biodiesel industry, which is heavily under pressure. Biogas for electricity is similarly under pressure, but has relevant potential for the production of chemicals and polymers. Furthermore, the huge demand for cellulose fibre in textiles should not be ignored; it could be a great opportunity to transform the European pulp industry.

Guarantee the supply security of high value industries. Every development of the political framework for the bio-based economy should guarantee the supply security of high value industries such as chemicals and materials in order to prevent them from leaving Europe and taking their value and employment with them. Affordable access to biomass plays a crucial role in this.

Creation of a positive environment. As long as bio-based products are more expensive than petrochemical products – because of lower volumes and higher raw material costs – there is a need for market pull as created by incentives and mandates, or at least a positive image is needed. A positive environment is necessary to achieve GreenPremium prices for bio-based products (Carus, Eder & Beckmann 2014). Both options need a real political commitment to the bio-based economy, to the transformation from a fossil to a bio-based raw material supply. This requires more than another roadmap and an additional research agenda. Surveys show that consumers have positive connotations with bio-based products – this should be supported and not undermined.

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Physicist, from 1983 to 1994 he worked for the IT industry, environmental institutes and the solar industry. In 1994, he co-founded nova-Institute and has been functioning as owner and Managing Director ever since. Michael Carus has more than 20 years of experience in the field of bio-based economy, including work on biomass feedstocks, industrial biotechnology and all kinds of bio-based materials. His work focuses on market analysis, techno-economic and ecological evaluation and creating a suitable political and economic framework for bio-based processes and applications.

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RED reform: European Parliament agrees to cap the use of traditional biofuels

What are the impacts on the bio-based material sector?

Authors: Lara Dammer and Michael Carus, nova-Institute (Germany)

In Brussels, the European Parliament, following the decision of the Environmental Committee one week earlier, has finally voted on 28 April 2015 to endorse at second reading the compromise agreed with the Council on the reform of the Renewable Energy Directive (RED) and Fuel Quality Directive (FQD) in the light of indirect land use change (ILUC). The compromise will be adopted this year after the Council's second reading in the upcoming months.

This short paper highlights the most important changes and additions and explains what they mean for the sector of bio-based chemicals and materials.

Since the new provisions of the Directive are only valid until the end of 2020, this does not constitute a long-term framework that could give security to investors – neither from the energy sector, nor from the material sector. The existing competition for biomass between the sectors is not mentioned, still ignoring highly value-adding and employment-creating bio-based industries. That means that the material sector needs to take the opportunity to influence the framework that will be created for the time up until 2030 in the next few years by actively participating in the political debates in Brussels and the member states to finally establish a level playing field.

The most important changes are summarized in this table and will be explained in more detail further below.

Measure in the ILUC reform	Expected impact on material use
1) 7% cap on food-crop based fuels	neutral/positive – delayed impact
2a) Non-binding 0.5% target on advanced biofuels	neutral
2b) Annex IX – double counting & wastes and residues	negative – high impact
3) ILUC criteria not binding	positive – low impact
4) Carbon capture and utilization for fuels	positive – low, delayed impact
5) Higher incentivization of green electricity	positive – high, delayed impact
6) Cascading use	positive – low, delayed impact

1) Cap on food-crop based fuels (first generation)

Current legislation requires EU member states to ensure that renewable energy accounts for at least 10% of energy consumption in transport by 2020. The compromise approved now states that first-generation biofuels should account for up to 7% of final energy consumption in transport by 2020 (7% cap). The overall target is nominally kept at 10%, but lowered further in real terms as explained below.

Interestingly, the document acknowledges that land use change risks can also occur if dedicated non-food crops for energy uses – such as short rotation coppice (SRC) – are grown on agricultural land. However, these crops are effectively excluded from the cap, which is explained by the alleged circumstance that “dedicated energy crops can have higher yields and potential to contribute to restoration of heavily degraded and heavily contaminated land”. First, higher yield efficiency is extremely doubtful (see Bos et al. 2012, de Bie 2013, Carus & Dammer 2014) and, second, there are no provisions in the legislation to restrict the cultivation of non-food crops to degraded or contaminated land. Even though it is arguable that the 7% cap is an improvement compared to the previous version

of the RED (in which it was expected that first generation crops would contribute to 8.6% of the transport energy demand¹), this can be very quickly counteracted if more dedicated energy crops were to be planted on agricultural land. Therefore, the exclusion of non-food crops grown on agricultural land from the cap is lacking scientific basis and does nothing to alleviate the pressure on agricultural land.²

Furthermore, since many Member States have not reached a 7% share of first generation biofuels in their transport energy demand, there is still potential for market growth. The growth might have been worse if the RED had not been amended at all, but this does not constitute a big step forward.

¹ Based on the “National Renewable Energy Action Plans”

² There has been some confusion in reporting about the compromise with some sources stating that the cap also refers to non-food crops such as switch grass or miscanthus that are grown on agricultural land. Since all feedstocks listed in Annex IX of the proposal are exempt from the 7% restriction, including these dedicated energy crops, this is in fact a misinformation.

Impact on material use: neutral/positive – delayed impact

Compared to the current RED, the pressure on agricultural land and biomass prices might not increase as strongly as feared – and a delayed positive impact on the material sector can be expected.

Many member states have yet to reach the new 7% threshold, so the demand for biofuels from agricultural biomass still has room to increase, leading to higher prices for biomass (which can only be paid by the subsidized bioenergy/biofuel sector), which means continued disadvantages for bio-based materials and chemicals. An unlimited contribution of food crop-based biofuels would have been even worse, though.

Disappointing: The EP has – at least in theory – recognized that the real competition is not about food crops, but about agricultural land. The question is not whether a food or energy crop is used for a non-food application, but on which land the biomass is grown. This is a first step towards a more rational discussion. However, since there are no practical and legal consequences from this insight, the framework is still not the right one to achieve the most efficient and science-based use of biomass for non-food applications, which is also detrimental to the development of bio-based materials and chemicals. So the opportunity was missed to switch from a differentiation between first and second generation to instead implement the criterion “grown on agricultural land”.

The 7% cap is therefore evaluated to have a neutral or delayed positive impact on the material sector.

So the limitation of the restriction to food crops as compared to all crops grown on agricultural land is seen as negative for the material sector, because an opportunity was missed to set biomass-using sectors in a more objective light.

2a) Boosting advanced biofuels by non-binding national targets

EU member states will have to set a national target for advanced biofuels, no later than 18 months after the Directive enters into force. These can be sourced from e.g. certain types of waste and residues as well as from new sources such as algae. The draft legislation sets an indicative target of 0.5% for the share of energy to be produced from advanced biofuels as a percentage of the energy derived from renewable sources in all forms of transport by 2020.

These national targets are not binding: Member states may set a lower target on certain grounds, such as a limited potential for production, technical or climatic constraints, or the existence of national policies that already allocate commensurate funding to incentives for energy efficiency and electric transport.

‘The absence of binding targets for advanced biofuels and renewable energy (ethanol) use in petrol, both key measures to differentiate better biofuels, and both supported previously by the European Parliament on several occasions, undermines the core objectives of this reform’, said Robert Wright, Secretary General of ePURE. For the material sector this means that there will probably not be strong incentives to push for these non-binding targets, therefore not adding to the existing competition.

Impact on material use: neutral

Since member states are free to set even lower targets for advanced biofuels than 0.5% it is not expected that this provision will strongly impact the material sector. However, combined with the double counting mechanisms explained below (2b), they might still contribute to increased competition for biomass.

2b) Annex IX & Wastes and Residues

The eligibility for double counting of certain biomass types included in Annex IX (see full list in Annex a of this paper) has strong impacts on the level playing field between biofuels and bio-based materials. Even though double counting existed already before for “biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material” (RED Art21(2)), there was no agreed list among all EU member states of the feedstocks that fit these criteria. The RED reform pursued the goal to set up such a list to strengthen the harmonized market which resulted in Annex IX. Not all of the included materials and fuels are classified as wastes and processing residues, but some are. For feedstocks classified as waste or processing residue it is much easier to fulfil the sustainability obligations and the double counting makes all Annex IX biomass more feasible in economic terms. Through the increased interest of fuel producers, the access to these feedstocks can become virtually impossible for all other industries. Unfortunately, the materials included in Annex IX cover several feedstocks that are actually used by high-value chemical industries, which now face serious supply risks. Thus, the provisions in Annex IX undermine the declared goals of the European Union to create more value-added, employment and innovation through a sustainable bio-based economy.

Some examples for feedstocks that are contested by both the chemical and the fuels industry are

- **Crude Tall Oil (CTO)** – CTO is used by the pine chemical industry to manufacture a broad range of high-value products. In Annex IX, it is even incorrectly classified as a residue, causing the pine chemical industry to strongly protest³. With the inclusion of CTO the ILUC text goes clearly into the wrong direction, because up to now it was highly doubtful whether double counting of CTO is in line with EU law, to say the least.
- **Glycerol** – a by-product of biodiesel production, glycerol is already used for high-value chemicals such as green epoxies. The current RED classifies crude glycerine as “processing residue”⁴ and the opportunity was missed to correct this error now.
- **Animal fats** – an important feedstock for the European oleo-chemistry, which needs to be replaced more and more by palm oil imports, causing higher costs and increased transport emissions (and probably land use changes). Animal fat based fuels are already double counted in many EU countries, but not in all, Germany being a positive exception. There is a clear risk that the ILUC text leads to more double counting of animal fats.

3 For more information and statements by the pine chemical industry, see www.realgreengold.com and Annex b) of this document

4 RED, Annex V, part C, number 18.

Even for those feedstocks that are currently not the subject of competition, the simple allocation to the energy sector does not make sense with regard to creating innovation and value-added in the European Union. For example, millions of Euros are currently invested into researching high-value chemical applications for algae or lignin, while both feedstocks are included in Annex IX. Commercial implementation of any newly developed technology from algae or lignin platforms outside the biofuels sector is highly unlikely if the feedstock supply is so insecure. (For a more detailed evaluation of the competition for these Annex IX feedstocks in an earlier version of the ILUC proposal, please see nova paper #4 on the RED reform, Carus et al. 2014).

Impact on material use: negative – high impact

Even though the target for advanced biofuels is not binding (and not all double counted feedstocks can contribute to the advanced fuel goal), the continuation of the double counting mechanism together with a sometimes doubtful classification as “wastes” and “residues” will further exacerbate the already distorted competition for biomass between energy and material uses. Instead of going to high-value applications, these biomass types will be used for subsidized biofuels and bioenergy and will be lost for the chemical industry. This is expected to have strong negative impacts on the material use sector, since in several cases there are existing plants to use the concerned feedstock types for energy, which have even more legal security to do so now. It is only a small consolation that the previously discussed quadruple counting of some biomass types was apparently discarded. For future classifications of feedstocks – if any should be done – it is absolutely vital that not only the energy sector is heard in deliberations, but also the chemical and material sector.

3) ILUC factors are out, for now

Taking estimated emissions caused by indirect land-use changes (ILUC factors) into account as a penalty for European biofuels was rejected due to the insufficient scientific basis and the resulting regulatory uncertainty.

However, fuel suppliers will report the estimated level of emissions caused by freeing up more land to grow food crops needed when land has been switched to biofuel crop production, known as indirect land-use change (ILUC) to EU countries and the Commission. The Commission will then report and publish data about these ILUC-related emissions. Later, the Commission is expected to report back to the EP and the Council, based on best available science, on the scope for including ILUC emission factors in the existing sustainability criteria.

Impact on material use: positive – low impact

The ILUC impact of promoting biofuels will probably be a side issue and, in absence of any strong political incentives there, the discussion will not enter the renewable material sector in the next years. This is positive, but is not expected to have a strong impact on the on-going competition for biomass. At least it does not exacerbate the situation of the material sector.

4) Carbon capture and utilisation for transport purposes

As a new element, transport fuels from carbon capture and utilization (also called CCU fuels, CO₂-based fuels, solar fuels or power-to-liquids) are now explicitly included in the RED. Annex IX lists

“(r) Renewable liquid and gaseous fuels of non-biological origin.

(ra) Carbon capture and utilisation for transport purposes, if the energy source is renewable in accordance with Art 2(a) of this Directive.

(rb) Bacteria, if the energy source is renewable in accordance with Art. 2(a) of this Directive.”

as fuels that shall be counted double and which do not count toward the 7% limit on first generation fuels. Under this regulation, the carbon source of the fuels is not relevant – it is therefore not important whether the CO₂ used for fuels stems from “green” or “black” carbon. The only decisive factor is that the energy used for the process stems from renewable resources, the legislator refrains from establishing a CO₂ saving requirement in line with the one existing for biofuels.

Furthermore, the compromise contains the passage that the Commission is empowered to adopt no later than by December 2017 greenhouse gas emission default values of CO₂-based fuels, including those from non-renewable energy sources, for the FQD, setting the values with which the CO₂-based fuels will count toward the 6% CO₂ reduction goal set out in the FQD.

Impact on material use: positive – low, delayed impact

Incentivising fuels made from carbon capture and utilization will lessen the pressure on biomass, if these fuels substitute biofuels in relevant volumes. That could mean lower prices for biomass and better access for the bio-based chemical and material industries. However, since the technology to produce CCU fuels is very young, production capacities are low and the installation of production plants is connected to considerable investment, it is expected that the development will take time and will have a very low impact in the nearer future. It is regrettable that the legislator decided to remove the quadruple counting for this specific option to comply with the renewable energy target for transport.

5) Green electricity for the transport sector

A greater use of electricity from renewable resources is seen as an important tool to decrease the amount of land used for biofuels and is therefore higher incentivised in the new proposal.

Of the electricity used by rail transport, the share that stems from renewable sources will be counted times 2.5 for the national 10% transport goal; the contribution is currently counted once. Energy from renewable sources used for car transport will even be counted times 5 towards the national transport goal whereas the current factor is 2.5. Note that these multipliers would not only apply to additional renewable electricity used in transport in the future but also to the present amount. To determine the share of renewable resources in the input mix, the average renewable share of the national energy mix or the EU energy mix, whichever is higher, is taken as a basis (as it is now).

of biomass. Since the reporting obligations of the Member States are not connected to any strong political incentives, however, the positive impact is expected to be low and delayed.

Impact on material use: positive – high, delayed impact

The stronger incentivization of using electricity to fulfil the renewable energy quota in the transport sector can reduce pressure on agricultural land, if the electricity stems from non-crop biomass renewable resources – namely solar and wind power. Apart from setting the right incentives for the future, the introduction of a new multiplier for rail and the increase of the multiplier for electric cars also have the effect that the target for renewable energy in transport is further lowered in real energy terms from the 10% set in nominal terms with a direct impact since the multipliers apply to already used renewable electricity in transport. This reduction compensates for putting the 7% limit (“cap”) on conventional biofuels⁵, so that no new gap emerges between the 7% cap and the 10% target. This gap would have had to be filled with additional advanced biofuels which would be partly based on problematic feedstocks with double counting, as outlined above. Not only will this reduce indirect land use change risks, but will also lessen the existing unfair competition for biomass between the material and the energy sector at a considerable amount of impact.

6) Cascading use

In the reform paper, „cascading use of biomass“ is mentioned for the first time in the context of the RED. Article 22, which defines the reporting duties of the Member States, shall be modified by the section:

“(i) the development and share of biofuels made from feedstocks listed in Annex IX including a resource assessment focusing on the sustainability aspects relating to the effect of the replacement of food and feed products for biofuel production, taking due account of the principles of the waste hierarchy established in Directive 2008/98/EC and the biomass cascading principle taking into consideration the regional and local economic and technological circumstances, the maintenance of the necessary carbon stock in the soil and the quality of the soil and the ecosystems;“

Impact on material use: positive – low, delayed impact

It is definitely a step in the right direction to specifically mention the term “cascading use” in the RED reform, since this adds to the credibility and the stability of the term, integrating it more and more in the political debate. This is evaluated to be very positive for the material sector, which would profit from an increased cascading use

⁵ Based on “National Renewable Energy Action Plans”

Annex a): List of biomass types eligible for double counting (Annex IX ILUC Proposal):

Part A. Feedstocks and fuels, the contribution of which towards the target[...] referred to in the first subparagraph of Article 3 [...] (4) shall be considered to be twice their energy content

- (a) Algae if cultivated on land in ponds or photobioreactors.
- (b) Biomass fraction of mixed municipal waste, but not separated household waste subject to recycling targets under point (a) of Article 11(2) of Directive 2008/98/EC.
- (c) Bio-waste as defined in Article 3(4) of Directive 2008/98/EC from private households subject to separate collection as defined in Article 3(11) of that Directive.
- (d) Biomass fraction of industrial waste not fit for use in the food or feed chain, including material from retail and wholesale and the agro-food and fish and aquaculture industry, and excluding feedstocks listed in part B of this Annex.
- (e) Straw.
- (f) Animal manure and sewage sludge.
- (g) Palm oil mill effluent and empty palm fruit bunches.
- (h) Tall oil pitch.
- (i) Crude glycerine.
- (j) Bagasse.
- (k) Grape marcs and wine lees.
- (l) Nut shells.
- (m) Husks.
- (n) Cobs cleaned of kernels of corn.
- (o) Biomass fraction of wastes and residues from forestry and forest-based industries, i.e. bark, branches, pre-commercial thinnings, leaves, needles, tree tops, saw dust, cutter shavings, black liquor, brown liquor, fibre sludge, lignin and tall oil.
- (p) Other non-food cellulosic material as defined in point (s) of the second paragraph of Article 2.
- (q) Other ligno-cellulosic material as defined in point (r) of the second paragraph of Article 2 except saw logs and veneer logs.
- (r) Renewable liquid and gaseous fuels of non-biological origin.
- (ra) Carbon capture and utilisation for transport purposes, if the energy source is renewable in accordance with Art 2(a) of this Directive.
- (rb) Bacteria, if the energy source is renewable in accordance with Art. 2(a) of this Directive.

Part B. Feedstocks, the contribution of which towards the target referred to in the first subparagraph of Article 3(4) shall be considered to be twice their energy content

- (a) Used cooking oil.
- (b) Animal fats classified as categories 1 and 2 in accordance with Regulation (EC) No 1069/2009*

Annex b): The fight for Crude Tall Oil (CTO)

The case of Crude Tall Oil is a very good example of a distorted competition for a valuable renewable feedstock. The following press release by Arizona Chemical, Forchem and Respol of 27.04.2015 serves as an illustration:

Brussels – the ILUC directive jeopardizing the European bioeconomy development

INCORRECT CLASSIFICATION OF CRUDE TALL OIL A SERIOUS THREAT TO THE EUROPEAN PINE CHEMICAL INDUSTRY

This week the European Parliament will conduct its final vote on the ILUC Directive. A tiny detail in the Directive will, if adopted, have detrimental effects to the EU economy, environment and society.

Annex IX of the Directive lists and classifies some materials explicitly as *residues*. Upsettingly, that list also includes Crude Tall Oil (CTO), a scarce and valuable renewable biodegradable product, intentionally extracted and produced from soap in the kraft pulping process.

Even the Legal Services of the European Commission have examined the legal status of CTO and concluded that it is a *product*. It is hence legally, and scientifically, wrong to refer to CTO as a residue in the ILUC Directive. It is difficult to see why EU co-legislators would wish to accept such an evident and serious mistake in the draft legislation.

The pine-chemical industry, foremost Arizona Chemical in Europe, Forchem in Finland and Respol in Portugal, refine and upgrade CTO into numerous high value added products. These include important intermediates for various chemical companies and other EU-based industries producing paints, adhesives, car tires, hygiene commodities, substitutes for antibiotics and other new innovative solutions such as products enabling reuse of old asphalt. The R&D as well as the new upgrade investments of pine chemical bio-refiners are remarkable; they already employ more than 3,000 people and provide 1 billion euro turnover yearly in the EU without any State subsidies!

Kees Verhaar, CEO of the Arizona Chemical, says: “This addition of CTO as a residue in the Annex IX list stems from the desire of the Finnish and Swedish governments to support an exclusive use of CTO for their biofuel production. The incorrect residue classification makes it possible to circumvent EU obligatory sustainability criteria and to grant major State Subsidies, in the form of tax relieves, to this kind of fuel. The odd “double-counting” method allowed for residues in ILUC makes it possible for Finland to reach its bio-content quota in the traffic fuel distribution: You blend 10 percent bio but can report 20 percent to the EU!”

Michael Carus, Managing Director of nova-Institute, a renowned and independent research company, and a well known expert on the bio-based economy, says: “Several studies have shown that 5 to 10 times more gross employment and added value is created per unit of land or ton of biomass by material use than energy use. This is largely due to the considerably longer process and value chains for material use – and the higher value of the products. Using CTO for energy is a misallocation of a high-value biomass.”

Risto Näsi, CEO of Forchem, comments: “CTO is a scarce product. Fuel is bulk produced in extensive volumes and may suck huge volumes of available CTO. In the EU, there is a shortage on CTO and the refiners have to source it from around the world. There is no net gain for society to direct it, by artificial demand, from lucrative biochemical business to State aided biofuels.”

Rui Brogueira, CEO of Respol, adds: “We are ready and well equipped to continue to compete for this fine product, but we want a fair and competitive market that is not seriously distorted by the political intervention causing severe damage to the existing and innovative bio-refining.”

Bio-based economy: market pull measures for bio-based products (nova-Institut June 2015)

Preliminary list – basis for discussion; thank you for the great feedback and many additional suggestions from industry experts. More ideas and feedback are still welcome! (lara.dammer@nova-institut.de)

Aside from incentives for feedstock or production, it is possible to stimulate market pull in order to support bio-based products and materials. Bans and mandates for certain product groups constitute one way to create such a pull. The following list is a compilation of ideas for which bio-based product groups it would make sense to implement bans and mandates. All of the proposed measures are based on environmental or health reasons.¹

No.	Measure	Reason	Who / what benefits?	Notes
A-C	Specific market pull measures: Mandatory regulations / Directives for bio-based & biodegradable materials; bans against conventional materials	Environmental reasons	Bio-based & biodegradable materials reach new markets	
A	Agriculture and forest			
A1	Mandatory bio-based and biodegradable (in soil) materials in specific agro- and geotextiles and other agricultural equipment such as mulching films , tree protection, silage films, agricultural twines, tomato clips, vineyard clips, grass nails, carrier materials for pesticides and fertilizer, polymer coating for seeds, pest protection bags for fruit, consumable elements for trimming machines, nails for road side construction	Environmental reasons: To avoid plastic waste and plastic microparticles in the environment, especially in soil and water.	Bio-based plastic materials and natural fibre mulch mats & textiles, which biodegrade (fast) in soil and water	
A2	Mandatory use of biodegradable plastics in all other plastic items that typically end up in nature (golf tees, hunting cartridges, ropes...)	Environmental reasons: To avoid plastic waste and plastic microparticles in the environment, especially in soil and water.	Biodegradable plastics and other bio-based materials that biodegrade fast in soil and water	
A3	Mandatory bio-based and biodegradable lubricants in environmentally sensitive contexts (chain saws, boats and ships, harvesting equipment)	Environmental reasons: To avoid non-biodegradable / toxic lubricants to enter the environment, especially in soil and water.	Bio-based and biodegradable chain-saw lubricants (biodegradable in soil and fresh water)	
	Consumer products			
B1	Mandatory bio-based and home compostable fruit stickers – sticker materials AND adhesives	Environmental reasons: Non-biodegradable fruit stickers cause problems in home compost; plastic microparticles enter soil and water.	Bio-based and home compostable plastics	
B2	Ban on non-biodegradable plastic peeling particles in cosmetics and body care products	Environmental reasons: To avoid microparticles in the environment, especially in soil and water.	Bio-based and fast biodegradable materials (in fresh water and marine water)	
B3	Mandatory nanocellulose films for transparent envelope windows and package stickers	Environmental reasons: Transparent plastic films in envelope windows hinder the paper recycling.	Nanocellulose films	

¹ The term “bio-based & biodegradable” refers to products that are completely biodegradable, but not necessarily 100% bio-based. For some applications, a bio-based share of less than lower bio-based share of for example 50% might be the maximum that is currently technically possible.

B4	Mandatory use of bio-based and bio degradable materials (cotton and cellulose in combination with biodegradable plastics for films and absorbers and hydrogels) for hygiene articles that are often discarded via sewage: wipes, tampons, diapers, maxi pads etc.	Environmental reasons: To avoid plastic waste and plastic microparticles in the environment, especially in soil and water.	Biodegradable plastics and other bio-based materials (lignin, hemicellulose) that biodegrade fast in soil and water	
B5	Mandatory use of (home)compostable plastics for coffee capsules	Environmental reasons: Aluminium and other plastic coffee capsules pose massive littering problems; on the other hand coffee grounds serve as excellent additive for compost. Home-comp plastic littering and improve quality of compost and soil.	Home-compostable plastics	
B6	Mandatory use of 100% home-compostable materials for tea bags (as they were in the past made from 100% abaca fibres), no non-compostable materials should be added	Environmental reasons: consumers are not aware of non-compostable materials being used for tea bags and dispose them in the home compost.	Home-compostable materials (plastics and fibres)	
B7	Ban on non-compostable and non-biodegradable plastic bags for wrapping fruit, meat, etc. (EP 16.04.2014)	Environmental reasons, avoid plastic littering to enter soil and water. Recycling of plastics mixed with wet waste from fruit or meat is not the preferred option.	Biodegradable plastics	EP draft: by 2019
B8	Mandatory use of biodegradable plastic dishes and utensils for catering services	Environmental reasons: Intensive use and contamination of plastic utensils with food makes cleaning and recycling water and energy intensive and uneconomic; biodegradation much more feasible.	Bio-based and biodegradable plastics	
B9	Mandatory use of biodegradable plastics in cleaning erasers that dissolve during use	Environmental reasons: Avoidance of significant amounts of microparticles in the air and waste water.	Bio-based and biodegradable plastics	
C	Industry and public services			
C1	Mandatory use of biodegradable chemicals / materials for all products injected in the ground: tracking fluids, drilling muds, mining fluids...	Environmental reasons: To avoid toxic and durable chemicals in the soil.	Biodegradable chemicals	
C2	Mandatory use of (slowly) bioegradable plastics in marine water for fishing nets	Environmental reasons: By-catch from floating fishing nets that are forgotten and left in the ocean pose a big threat to fish populations. If these nets were to biodegrade after a while, the threat could be reduced.	Biodegradable (in marine water) plastics	
C3	Mandatory use of biodegradable printing ink for newspapers etc.	Environmental reasons; facilitates easier recycling of large volumes of paper.	Bio-based and biodegradable inks	
C4	Mandatory use of biodegradable / compostable plastics in hospital applications	Health and environmental reasons: A closed cycle in the hospital with collection and biodegradation of plastic goods would prevent contaminated plastics from entering the waste disposal system. Special properties of new bio-based plastics can help to kill germs more quickly.	(New) bio-based and biodegradable plastics	
C5	Mandatory bio-based and biodegradable body bags and urns (and other funerabilia such as coffins, body bags...)	Environmental reasons: Conventional body bags are PVC, practically mummifying deceased persons. After 30 years burial, when graves are emptied, this leads to dramatic situations.	Biodegradable plastics and biodegradable naturally reinforced composites (for example for urns or coffins)	Already mandatory in FR and NL.

C6	Food, cosmetics and pharmaceuticals: Replace hormone impacting plasticizers and endocrine disruptors by bio-based and (if possible) biodegradable solutions.	Health reasons: Reduced hormone impacting ingredients would have a positive long-term impact for the health of end consumers.	Plant-oil based or new bio-based building blocks	
D	Food-related			
D1	Promote Xylitol as C5 sugar alternative from trees	Health reasons: Less calories than sugar and non-cariogenic	Lignocellulosic biorefineries based on wood and agricultural by-products	
E-F	Market pull measures for durable bio-based plastics and other bio-based materials	Environmental reasons: Incentives to reduce the CO₂ footprint of plastics.	Creating new markets for bio-based plastics and natural fibres	
E	Construction			
E1	Construction Products Regulation: Include more specifications on wood, lignin and other bio-based construction materials as alternative to fossil materials (e.g. through stricter VOC regulations)	Environmental reasons: Lower carbon footprint of bio-based construction materials (foams for insulation, composite material, mortar, and concrete made of vegetative aggregate particles) is not accounted for in the Construction Products Directive, even though these products have now become sufficiently advanced to offer a real alternative.	Woodworking industry, bio-based composites and foams, others	see LMI recommendation
E2	Insulation material: For natural fibre materials, important properties (heat transfer delay, thermal conductivity, regulation of moisture) need to be fairly covered by construction regulations, norms etc.	Environmental and health reasons: Construction industry becomes more sustainable and consumers benefit from healthier room climates.	Natural fibre industry	
E3	Include bio-based materials in construction in the Carbon Capture & Storage (CCS) programme (very good carbon storage effects of durable bio-based materials)	Environmental reasons: Climate protection through carbon storage in the next 50 to 100 years with bio-based construction materials.	Durable bio-based plastics and composites in construction	
F	Automotive			
F1	End-of-life vehicle directive: one proposal is to consider the share of biomass in the material as materially recycled regardless of how they are recovered (the green CO ₂ in the bio-based materials was absorbed by crops before and does not contribute to climate change). This could be an incentive for the automotive industry to increase use.	Environmental reasons: So far, there no incentives for bio-based products in cars, although they usually have a lower carbon footprint.	Bio-based plastics and composites, natural fibres	
G	Plastics in general			
G1	Minimum bio-based share of 10% (increasing continuously) for all polymers, if bio-based drop-in polymers with identical properties exist	Environmental reasons: Incentives to reduce the CO ₂ footprint of plastics; No technical arguments that prevent an implementation (from production to recycling).	Bio-based drop-in plastics such as bio-based PE, PP and PET	Via the Eco-Design Directive?
G2	Limits for average CO ₂ footprint per kg plastics for mass products; for example 3,0 CO ₂ equivalents per kg in the beginning, continuously lowered through the years	Environmental reasons: Incentives to reduce the CO ₂ footprint of plastics.	Recycled plastics, best petrochemical plastics and a full range of bio-based plastics	Needs clarification

Examples of applications in which biodegradable plastics would be a suitable solution (nova-Institute 2015)



Ecovio® F Mulching film
BASF 2015



Mulching film
nova 2015



Bio-Fed® Plant clip
Metabolix 2015



BioTAK® Fruit sticker
SAI 2015



Plant pot
nova 2015



Forest sign
nova 2015



Tree protection
nova 2015



Tree protection
nova 2015



Part of tree protection
nova 2015



String for grass trimmer
(oxo-fragmentable) nova 2015



Blades for grass trimmer
nova 2015



Dirt eraser
nova 2015



Cable fixer
nova 2015