

TAKING BIO-BASED FROM PROMISE TO MARKET

Measures to promote the market introduction of innovative bio-based products

**A report from the Ad-hoc Advisory Group for Bio-based Products
in the framework of the European Commission's Lead Market Initiative**

Published 3 November 2009





European Commission
Enterprise and Industry

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NB-31-09-225-EN-C

ISBN 978-92-79-14056-3

doi: 10.2769/34881

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PREAMBLE

The European Commission, in the framework of the Lead Market Initiative, has appointed an Ad-hoc Advisory Group for Bio-based Products, which has carried out its tasks according to the terms of reference. The current report focuses on measures relating to legislation, policies, standards, labels, certification and public procurement. The topics of communication, awareness and access to finance need to be elaborated further in a future report.

Brussels, 3 November 2009



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Chairman of the Advisory Group



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EXECUTIVE SUMMARY

The Advisory Group's main recommendations to promote bio-based products are summarised below in the order as they appear in the text.

Legislation promoting market development

- The biological/biobased carbon contained in bio-based products shall be deducted in the calculation of the total CO₂ equivalent emissions of the products.
- Consider setting indicative or binding targets for certain bio-based product categories, drawing on the experience from biofuel quotas in the EU.
- Allow Member States to reduce taxes for sustainable bio-based product categories.

Product-specific legislation

- Allow bio-based plastic to enter all waste collection and recovery systems, including composting, recycling and energetic recovery (depending on the type of plastic and compliance with applicable standards). Bio-based plastics certified compostable according to EN 13432 should gain unhindered access to biowaste collection.
- Study the possibility of mandating the use of bio-lubricants and hydraulic fluids in environmentally sensitive areas. This could be implemented e.g. via soil protection and water protection legislation.
- Bio-based construction materials (foams for insulation, composite material, mortar, and concrete made of vegetative aggregate particles) have now become sufficiently advanced to offer a real alternative. The Construction Products Directive should promote the specificities of bio-based products. In addition, new and transparent standards showing the product capabilities are needed to help demonstrate that bio-based materials comply with construction legislation.

Legislation related to biomass

- Legislation and policies must allow renewable raw materials for industrial use to be available in sufficient quantity of good and guaranteed quality and at competitive price.
- Increase investments in developing and optimising infrastructures and logistics for an optimal use of all available biomass (including waste).

Encourage Green Public Procurement for bio-based products

- Encourage contracting authorities in all EU Member States to give preference to bio-based products in tender specifications. A requirement or a recommendation to give preference can be laid down in a national action plan adopted by the government. Preference should be given to bio-based products unless the products are not readily available on the market, the products are available only at excessive cost, or the products do not have an acceptable performance.

Standards, labels and certification

- Develop clear and unambiguous European and international standards. The standards will help to verify claims about bio-based products in the future (e.g. bio-degradability, bio-based content, renewable carbon, recyclability, and sustainability).
- The sustainability assessment should be based on all three pillars of sustainability: environmental, social and economic. While we need (to develop) tools to assess sustainability of products, we need to ensure the tools used will stimulate and not limit the development and implementation of bio-based products.
- Begin a reflection process on what types of specific product labels are suitable for bio-based products and what information to be given to the consumer.

Financing and funding of research

- Continue to stimulate and enhance technological innovation and the development of technology: setting up demonstration projects via public-private partnerships.

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INTRODUCTION

The European Commission's Lead Market Initiative aims to facilitate an early adoption of technological innovation on various markets. By removing barriers and introducing new ideas to facilitate market entry, it will be possible to build early markets of sufficient scale that help to justify costly investments, bring down unit production costs, generate higher returns on investment, and reduce risks for investors and entrepreneurs.

In the case of bio-based products, research and innovation have reached a stage where products are ready for market introduction. However, renewable raw materials are only used in certain product categories and mostly manufactured in small volumes¹.

Despite having a strong chemical industry, Europe is behind the United States in promoting and offering bio-based products on the market on a broad scale. US federal agencies and some US states give active preference to bio-based in the procurement of goods and services. However, this gives Europe the opportunity to learn from the US experience and attempt to catch up quickly. A precondition for achieving this is an effective coordination between Europe's national governments, companies, associations, consumer groups, and European institutions.

An improved uptake of technologies related to renewable (bio-based) raw material and biological processes can give Europe advantages e.g. in terms of stronger industrial competitiveness, raw materials diversification, a quicker route to sustainability, an efficient and sustainable use of natural resources, and a rapid development of new consumer markets.

Bio-based products are of high societal and economic interest due to several positive factors²:

- Ü Use of renewable and expandable resources
- Ü Less dependency on limited and increasingly expensive fossil resources
- Ü The potential to reduce greenhouse gas emissions (carbon neutral / low carbon impact)
- Ü The potential for sustainable industrial production
- Ü Potentially better recovery and recycling options
- Ü Often low toxicity
- Ü Often high bio-degradability or compostability
- Ü Less resource-intensive production (water, energy, waste)
- Ü Potentially improved population health
- Ü Support to rural development
- Ü Increased industrial competitiveness through innovative eco-efficient bio-based products

This report targets innovative bio-based products on the basis of the definition in the 2007 Commission report.

Definition: Bio-based products refer to non-food products derived from biomass (plants, algae, crops, trees, marine organisms and biological waste from households, animals and food production). Bio-based products may range from high-value added fine chemicals such as pharmaceuticals, cosmetics, food additives, etc., to high volume materials such as general bio-polymers or chemical feedstocks [i.e. building blocks]. The concept excludes traditional bio-based products, such as pulp and paper, and wood products, and biomass as an energy source.

Innovative bio-based products made from wood or ligno-cellulose derivatives are considered to be part of the scope.

The traditional products food, feed, fuel and energy are not part of the scope, but are covered by other initiatives at national or European level.

This report makes frequent reference to the sustainability principle, which is used in accordance with the European Union Strategy for Sustainable Development³ (reviewed in 2009⁴). The strategy recognises that in the long term, economic growth, social cohesion and environmental protection must go hand in hand.

¹ With the exception of biofuels and some bio-based plastics.

² Commission report "Accelerating the development of the market for Bio-based Products in Europe" which was prepared in connection with the Communication on the Lead Market Initiative (COM(2007) 860 final).
http://ec.europa.eu/enterprise/policies/innovation/files/lead-market-initiative/prep_bio_en.pdf

³ http://ec.europa.eu/sustainable/sds2001/index_en.htm

The fact that a product is bio-based is not alone a proof of its sustainability; a range of other factors need to be considered (e.g. health, safety, environmental effects, waste). The Advisory Group considers that the assessment of bio-based products should take environmental, economic and social issues into consideration together, so that practicable solutions can be implemented.

Biodegradation and compostability are two important notions defined as:

- Biodegradation is a degradation caused by micro-organisms (e.g. fungi, bacteria, algae). The final products are, like in natural processes, water, carbon dioxide or methane, depending on the oxygen amount during the process.
- Compostability is a property of a material to be biodegraded under composting conditions.

THE TASK OF THE ADVISORY GROUP

The European Commission has appointed an Ad-hoc Advisory Group in order to carry out the following tasks:

- to implement the activities of the bio-based products action plan, laid down by the Commission, in cooperation with the Commission, Member States, industry and other stakeholders;
- to further develop and define the activities described in the action plan;
- to make recommendations for policy action at the national or European level;
- to ensure that the activities will be coordinated with public authorities, business, civil society and other stakeholders.

According to its rules of procedure, the Ad-hoc Advisory Group will report back to the Commission in 2009.

MARKETS FOR BIO-BASED PRODUCTS

The Bio-based Products Lead Market covers a broad range of intermediate products, product components, and ready-made products, e.g. bio-based plastics, bio-lubricants, bio-fibres for textiles, composite materials for construction and automotive, chemical and pharmaceutical building blocks, organic acids, amino acids, and enzymes⁵. Biological raw material from plants and trees, or waste, is renewable in the short term (less than 10 years), as opposed to fossil material renewable in 10 million years. Bio-based products can thus make a sizeable contribution to CO₂ reductions.

There are already several bio-based products on the market in Europe; for instance, the chemical industry is estimated to use 8-10% renewable raw materials to produce various chemical substances⁶.

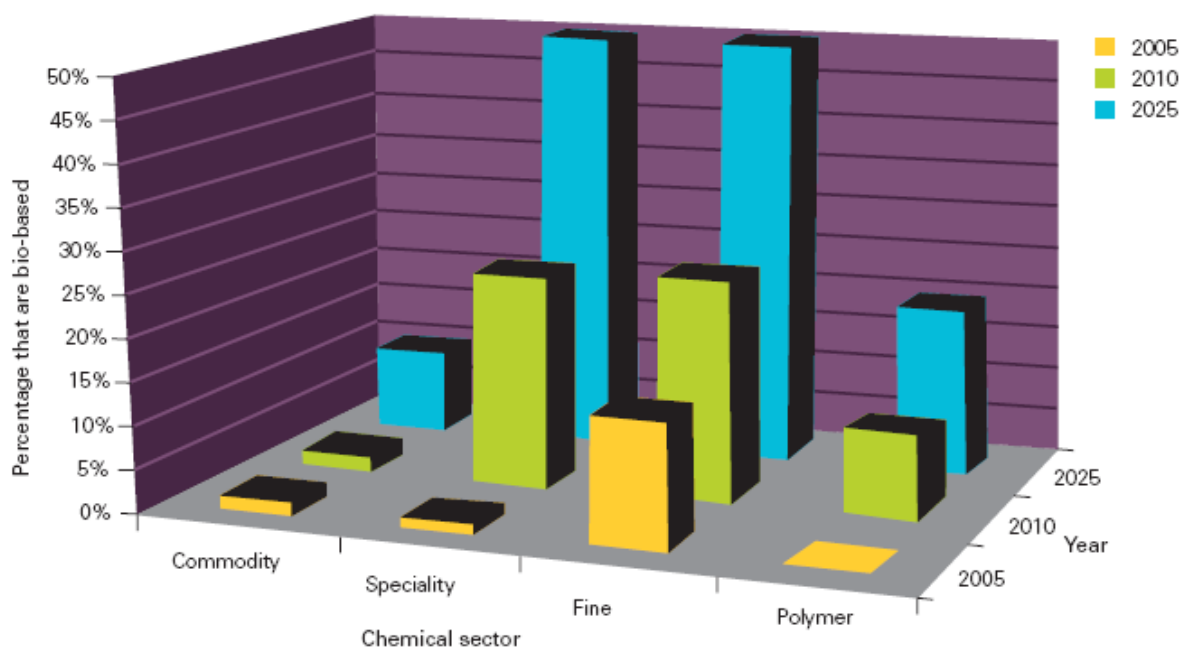
⁴ http://ec.europa.eu/sustainable/welcome/index_en.htm

⁵ Energy and fuels from renewable raw materials, and in addition food and feed, are excluded from the scope of the Lead Market Initiative.

⁶ The Commission report "A lead market initiative for Europe - Explanatory Paper on the European Lead Market Approach: Methodology and Rationale", pages 63-64. An estimate from Fachagentur Nachwachsende Rohstoffe is 8% in 2003. A McKinsey report estimated the share to 10% in 2010.

http://www.dsm.com/en_US/downloads/sustainability/white_biotech_mckinsey_feb_2009.pdf

Chart 1: Predicted market penetration of bio-based chemicals in world chemical production, excluding pharmaceuticals^{7,8,9,10,11}.



Source: "IB 2025, Maximising UK Opportunities from Industrial Biotechnology in a Low Carbon Economy, A report to government by the Industrial Biotechnology Innovation and Growth Team, May 2009"

In other market segments, the market shares for bio-based products are still very low. Europe has a few small companies specialised in bio-based products and several major chemical companies developing bio-based applications.

The aim is to enhance market demand for eco-efficient bio-based products, in order to exploit the positive environmental impact of bio-based products¹². A limited availability and increasing relative cost of fossil resources are driving factors for an increased demand for bio-based products in the EU, as well as policy developments intended to mitigate climate change and promote sustainable production and consumption¹³.

In addition, bio-based products may offer specific innovative properties that have advantages over other products. For example, in sensitive environments, hydraulics and chains can use biodegradable lubricants that are non-toxic to soil and water.

⁷ BERR [2009], "IB 2025 - Maximising UK Opportunities from Industrial Biotechnology in a Low Carbon Economy - A report to government by the Industrial Biotechnology Innovation and Growth Team"; <http://www.berr.gov.uk/files/file51144.pdf>

⁸ "The Current Market for Industrial Bioproducts and Biofuels & Foreseeable Trends for the Period 2015 / 2030 – Summary" by ADEME / ALCIMED, April 2007; http://www.errma.com/new/index.php?option=com_docman&task=doc_details&gid=28&Itemid=24

⁹ "Market Analysis Renewable Resources" by Dr. Norbert Schmitz, meóConsulting Team; http://www.errma.com/new/index.php?option=com_docman&task=doc_download&gid=27&Itemid=24

¹⁰ "Market analysis of key renewable materials and product sectors - Main Report - Volume 1". Report to the National Non Food Crops Centre, UK; <http://www.nnfcc.co.uk>; "Biochemical Opportunities in the United Kingdom"; NNFCC 08-008; http://www.nnfcc.co.uk/metadot/index.pl?id=7934;isa=DBRow;op=show;dbview_id=2539; "Techno-Economic Assessment of the Potential for a PLA Manufacturing Plant in the UK"; NNFCC Project Factsheet: Project No. 08-009; http://www.nnfcc.co.uk/metadot/index.pl?id=7885;isa=DBRow;op=show;dbview_id=2539

¹¹ Festel Capital estimates that in 2017, the sales of products made by biotechnological processes will be around €340bn, or 15.4% of total chemical sales, with polymers&fibres, active pharmaceutical ingredients, cosmetics, organic chemicals, and detergents as the most important segments. Presentation by Gunnar Festel at European Forum for Industrial Biotechnology, Lisbon 21 October 2009.

¹² In accordance with the request from the Competitiveness Council in May 2007 to the Commission.

¹³ Commission report "Accelerating the development of the market for Bio-based Products in Europe" [2007]

Table 1: Non-exhaustive overview of the most common types of bio-based products and their main characteristics or functionalities (note: food, energy and fuel are excluded from the scope).

Product type	Characteristics or functionalities
Chemicals and chemical building blocks Various chemicals made from renewable raw materials.	Sustainable chemical production, lower GHG and other emissions in production, lower resource use in terms of energy, water and less waste depending on production process, typically better biodegradability, potentially less toxic.
Bio-based plastics, biopolymers, and biomaterials¹⁴ E.g. Polyhydroxyalkanoate (PHA), Polyethylene (PE) from sugar cane, Polylactic Acid (PLA) through fermentation of starch or glucose, and propanediol-based plastics.	Sometimes biodegradable and/or compostable, savings in GHG emissions, potentially less toxic, materials with new qualities (composite materials, textiles, boards, etc).
Renewable construction materials and composite materials from natural fibres E.g. flax, hemp, jute, wood used in building construction and automotive components, etc.	Good mechanical properties (impact resistance, acoustic qualities, strongly reduced weight/lightweight concrete), better waste recycling (easier to recycle or burn than fibreglass),
Surfactants Surfactants lower surface tension of liquids and are used in soaps, detergents, pharmaceuticals, food additives, etc. and for the production of emulsions and foams. They are produced largely from oils. Next generation "biosurfactants" can be produced from algae or bacteria.	Low eco-toxicity, offers biodegradability and compostability. Enzyme-based detergents are used in household washing machines and offer environmental advantages (lower temperature, energy savings, more efficient washing, have replaced phosphorus).
Biosolvents Solvents are used in paints, inks, varnishes, adhesives, etc.	Bio-based solvents do not emit volatile organic compounds (VOC) which are harmful to human health and the ozone layer. 23% of VOCs emitted into the air are from petrochemical solvents.
Biolubricants Lubricants made from vegetable oils and their direct derivatives for engines, gearboxes, chains, etc.	Biodegradability, lower toxicity, can be used in sensitive environments, may reduce pollution of non-biodegradable or otherwise not environmentally acceptable lubricants from machines and vehicles.
Enzymes, amino acids and organic acids These types of molecules can be used e.g. to enhance industrial processes, to produce food and feed supplements, and as building blocks for bio-polymers, cosmetics and pharmaceuticals.	Economic value-added when used as inputs in various industries. Constitute technological advances that improve products or processes. Environmental benefits, e.g. enzymes can replace several steps in chemical synthesis, save energy and avoid toxic chemicals (e.g. acid, alkali).

It should be kept in mind that **renewability** is not always associated with **biodegradability**. Bio-based products are not one homogeneous group. For instance, bio-based polymers and lubricants may become very different depending on the production process.

Bio-based components can be mixed with non-bio-based components (e.g. from fossil oil). They can also be treated through industrial processes that change their biological properties considerably, most notably biodegradation. The biodegradable nature of the original biological material can be conserved or lost, as a result of chemical modification or combination with non-biodegradable moieties, or both (see Tables 2 and 3 for a description of how renewability and biodegradability can be found in all possible combinations)¹⁵.

¹⁴ Biomaterials include e.g.: fibre products, lumber, leather, laminates, roofing, insulation, blends of biopolymers with other components

¹⁵ In some applications, the loss of biodegradability can be negative (e.g. disposable products, expected to have a short life) while in other applications (e.g. durable products, expected to last) this is positive.

Table 2: Use of term “biopolymer” (based on FprCENTR 15932)

Origin of material	Biodegradability	Example	The meaning of the prefix "bio-"
Renewable	Biodegradable	Polyhydroxyalkanoate (PHA)	Biodegradable and bio-based
Non-renewable	Biodegradable	Polycaprolactone (PCL)	Biodegradable
Renewable	Non-biodegradable	Polyethylene (PE) from sugar cane	Bio-based
Non-renewable	Non-biodegradable	Polyetheretherketone (PEEK) for biomedical applications	Biocompatible

For other product categories, there are not yet European standards. A draft overview of the characteristics of bio-lubricants is provided in Table 3.

Table 3: Use of term “bio-lubricant”

Origin of material	Biodegradability	Example	The meaning of the prefix "bio-"
Renewable	Rapidly biodegradable	Rapeseed oil, TMP trioleate (TMPO)	Biodegradable and bio-based
Non-renewable	Biodegradable	Di-isotridecyl-adipate (DITA)	Biodegradable
Renewable	Non-biodegradable	Hydrocarbons from Biomass-to-Liquid process (BtL)	Bio-based
Non-renewable	Non-biodegradable	White oil for foodgrade lubricants	Biocompatible

Table 4: Use of term “bio-hydraulic fluid”¹⁶ (according to a draft German self-commitment)

Performance	Requirement / testing criteria
Biodegradability	• 60% according to OECD 301 B, D, or F
Toxicity	No toxicological or environmental classification according to <i>Regulation (EC) No 1907/2006 REACH</i> ¹⁷ .
Renewability	Carbon content derived from renewable raw materials • 50%, calculated according to the method described in EC Ecolabel Directive 2005/360/EC.
Technical performance	According to ISO 15380

¹⁶ Tables 2-4 show that “bio” can either refer to “biodegradable” or “bio-based”. As long as no general definition is available for lubricants, the draft definition in Table 4 is suggested, which was included a self-commitment for “bio-hydraulic fluids” by German lubricant manufacturers under the umbrella of the German Machinery Association. A stringent definition will be one of the main targets of the new CEN/TC 19/WG 33 “Bio-Lubricants”.

¹⁷ Regulation (EC) No 1907/2006 of the European Parliament and the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

http://ec.europa.eu/enterprise/sectors/chemicals/documents/reach/index_en.htm

ACTION PLAN FOR BIO-BASED PRODUCTS

The Action Plan presented in Annex I¹⁸ to the LMI Communication¹⁹ outlined six actions for the period 2008-2011. The Commission's Task Force on Bio-Based Products issued the report "Accelerating the Development of the Market for Bio-based Products in Europe"²⁰, which describes the action plan in more detail.

The progress made on each action item and sub-item during the period 2008-2009 is described below.

ACTION 1: ESTABLISH AN ADVISORY GROUP, INCLUDING MEMBER STATES AND INDUSTRY

In 2008, the Commission set up an expert group composed of representatives from national governments, industry and academia, entitled the Ad-hoc Advisory Group for Bio-based Products. It has analysed the current market conditions and how the legislative framework affects the introduction of products made from renewable raw material.

The Advisory Group has become functional and started to perform its work successfully in an extremely short time (six months) considering the size of the task. It is the first time that a cross-disciplinary expert group has been set up at European level to discuss on renewable raw materials as well as bio-based products. It is apparent that its mixed composition has given the group a great dynamic that is reflected in the quality of its work.

ACTION 2: ANALYSE THE IMPACT OF LEGISLATION AND POLICIES

Bio-based products are affected directly or indirectly by a large number of legal acts and public policies at EU, national or even local level. The Ad-hoc Advisory Group for Bio-based Products has analysed the impact of existing legislation and policies on products made from renewable raw material. The analysis has focused on all the different steps in the production and supply chain, including:

- Ü the supply of renewable raw materials,
- Ü the production of intermediate chemicals, materials and components,
- Ü the manufacture of assembled products,
- Ü retail market conditions,
- Ü the use of bio-based products,
- Ü the disposal of bio-based products as waste, through re-use, recycling, recovery or other options.

This analysis is complicated for two reasons: many legal acts at different levels influence the manufacture, sale and disposal of bio-based products; and bio-based products are not one uniform product group, but a broad range of products with completely different characteristics, qualities and uses.

¹⁸ SEC(2007) 1729, of 21/12/2007

¹⁹ COM(2007) 860 final, of 21/12/2007

²⁰ http://ec.europa.eu/enterprise/policies/innovation/files/leard-market-initiative/lep_bio_en.pdf

Already achieved (a non-exhaustive list with examples)

- The Construction Products Directive (Directive 89/106/EEC) has been revised to recognise wood materials as an alternative to concrete. Refer to the proposal for a Regulation laying down harmonised conditions for the marketing of construction products (COM(2008) 311 final)
More info: http://ec.europa.eu/enterprise/construction/index_en.htm
- The recast of the "Integrated Pollution Prevention and Control legislation" (IPPC) (Directive 2008/1/EC replaces Directive 96/91/EC and subsequent amendments)
More info: <http://ec.europa.eu/environment/air/pollutants/stationary/ippc/index.htm>
- The revised Regulation on Eco-labelling (the Commission proposal is expected to be adopted in autumn 2009)
More info: <http://ec.europa.eu/environment/ecolabel>
- The revision of the EU Eco-Management and Audit Scheme (EMAS), a management tool for companies and other organisations to evaluate, report and improve their environmental performance.
More info: http://ec.europa.eu/environment/emas/index_en.htm
- The implementation of laws on landfill of waste in the EU (Directive 1999/31/EC)
More info: http://ec.europa.eu/environment/waste/landfill_index.htm
- Packaging and packaging waste (Directive 2005/20/EC, 94/62/EC)
More info: http://ec.europa.eu/environment/waste/packaging_index.htm
- The 2009 revision of the Waste Framework Directive (Directive 2008/98/EC) for a better management of material resources and improved resource efficiency
More info: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:en:PDF>

Recommendations for action:

a) Legislation promoting market development

1. The biological/biobased carbon contained in bio-based products shall be deducted in the calculation of the total CO₂ equivalent emissions of the products.
2. Consider setting indicative or binding targets for certain bio-based product categories, drawing on the experience from biofuel quotas²¹ in the EU.
3. Allow Member States to reduce taxes for sustainable bio-based product categories.
4. Develop incentives for the conversion of production plants and industrial processes into bio-based, provided that they have proven to be sustainable, and that applicable EU State Aid rules are respected.

b) Product-specific legislation

5. Allow bio-based plastic to enter all waste collection and recovery systems, including composting, recycling and energetic recovery (depending on the type of plastic and compliance with applicable standards). Bio-based plastics certified compostable according to EN 13432 should gain unhindered access to biowaste collection²².

²¹ The European Council set a target of 10% of transport fuel in each EU Member State to be provided by biofuels by 2020. See point 7 under "IV. Energy efficiency and renewable energies" in the Presidency Conclusions of 8-9 March 2007: http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf

²² The mixing of waste streams should be considered carefully.

6. Systems for recovery and recycling of bio-based packaging should be supported by the Packaging and Packaging Waste Directive (PPWD). All recovery and recycling routes should be allowed for such packaging²³.
7. Bio-based products (e.g. packaging materials) in energy recovery can be recognised as a CO₂ reduction in comparison with non-bio-based products, if the net CO₂ balance shows a reduction.
8. If the starting raw materials are extracted from waste, legislation should recognise bio-based products as a "recycled and bio-based" material, thereby allowing bio-based plastic to be advertised in the same way as recycled material.
9. Bio-lubricants and bio-hydraulic fluids have improved significantly in recent years, offering better technical properties and excellent environmental behaviour. The current market share of bio-lubricants is estimated at roughly 4%, whereas they could technically reach a 90% market share²⁴. Improve the knowledge among users by developing industry standards and providing information on the properties of bio-lubricants.
10. Study the possibility of mandating the use of bio-lubricants and hydraulic fluids in environmentally sensitive areas. This could be implemented e.g. via soil protection and water protection legislation.
11. Bio-based construction materials (foams for insulation, composite material, mortar, and concrete made of vegetative aggregate particles) have now become sufficiently advanced to offer a real alternative. The Construction Products Directive should promote the specificities of bio-based products. In addition, new and transparent standards showing the product capabilities are needed to help demonstrate that bio-based materials comply with construction legislation²⁵.

c) Legislation related to biomass

12. Legislation and policies must allow renewable raw materials for industrial use to be available in sufficient quantity of good and guaranteed quality and at competitive price.
13. Replace the former CAP "production refund" with an alternative incentive to support the use of renewable raw materials for industrial uses in CAP post-2013.
14. As far as the Annex 1 of the EC Treaty products are concerned the use of renewable raw materials for industrial use should be equally considered for direct support schemes for farmers²⁶. Member States shall design rural development plans to include actions that prioritise in climate change, renewable energies, water management or biodiversity. This would reduce the current inequality of aid between energetic and industrial uses of renewable raw materials for products of Annex 1 of the EC Treaty.
15. Increase investments in developing and optimising infrastructures and logistics for an optimal use of all available biomass (including waste).
16. Improve agricultural land productivity in a sustainable way in the EU and in third countries, e.g. through yield increase, reuse of degraded land, use of unused land, better land management, cropping system, etc.

d) International issues

17. Support efforts to cooperate internationally, in particular, with the United States, through (i) a confirmation of high-level political commitment and broad R&D support for the lighthouse projects on bio-based products; (ii) attempts to harmonise EU and US legislation based on best practice; (iii) attempts to harmonise industry standards and normative measures in the EU, US, Japan, China, Brazil, and other major trading partners.

²³ From a practical viewpoint, a specific recycling scheme needs sufficiently large waste flows. Waste production and waste recycling will have to develop in parallel. It is clearly a common prerequisite for all recycling processes to have homogeneous waste flows, since cross-contamination of materials affects recycling negatively.

²⁴ According to an estimate in 2006 by Fachagentur Nachhaltige Rohstoffe (Agency Renewable Resources, FNR) of the potential market share due to environmental and technical advantages:

<http://www.york.ac.uk/res/gcrn/presentations/Steffen%20Daebeler%20-%20Agency%20Renewable%20Resources.pdf>

²⁵ Refer also to the measures proposed for the Sustainable Construction Lead Market.

²⁶ COM 2008 306/4

ACTION 3: ESTABLISH A NETWORK BETWEEN PUBLIC PURCHASERS OF BIO-BASED PRODUCTS

A CIP call for proposals²⁷ for the development of public procurement networks was launched in November 2008 with a deadline for the submission of proposals in February 2009. Unfortunately, no proposal linked to bio-based products achieved the threshold for funding.

This further underlines the urgent need to develop European standards for bio-based products so as to underpin future actions such as an exchange of practices between contracting authorities.

ACTION 4: ENCOURAGE GREEN PUBLIC PROCUREMENT FOR BIO-BASED PRODUCTS

The potential for increasing demand for bio-based products through public procurement is huge, as European public authorities spend almost €2000 billion, or 16% of GDP, on goods and services yearly. Almost all product areas could potentially feature products made entirely or partly from renewable raw material. Likewise, the production of almost all types of services could potentially benefit from bio-based inputs.

By introducing requirements for sustainability in tender specifications, the demand from public authorities could significantly increase the market for green products and drive technological innovation. Member States have given political support to an increase in Green Public Procurement (GPP)²⁸. However, the improvements have to be accomplished through action at the national, regional and local level. This may be supported by normative measures (e.g. national targets or requirements for green public procurement). The difficulty in providing an inventory of public procurers at all different levels makes it inefficient to rely only on a bottom-up approach; normative measures can hence be helpful.

The Green Public Procurement Guidelines now include criteria that allow bio-based products to be given preference in tender specifications. The European Commission cooperates with Member States and stakeholders to set common GPP criteria for endorsement in national action plans. The fact that a product is bio-based is not alone a proof of its sustainability; a range of other factors need to be considered (e.g. health, safety, environmental effects, waste).

By integrating the requirement for bio-based content with other common GPP criteria and by applying the EU Eco-label to products complying with a minimum level of bio-based content set for that product category, public procurers are able to distinguish the products that should be eligible for preferential selection.

National GPP programmes can have a significant effect on the uptake of bio-based products. For instance, the Netherlands have legislated that 100% of the procurement should select sustainable goods and services. Although this should lead to an increased demand for bio-based products, the buyer may lack essential information:

- ü Is there a bio-based alternative available on the market?
- ü Is the performance as good as that of similar products?
- ü Is there a suitable European standard for bio-based products?
- ü Have the environmental claims been certified?
- ü What is the minimum level of renewable content to call the product "bio-based"?
- ü How to compare recycled material with bio-based material?

²⁷ ENT/CIP/09/C/N03S00

²⁸ The Communication from the Commission "Public procurement for a better environment" of 16 July 2008, COM(2008) 400 final, makes reference to sustainable development. It was supported by the Environment and Competitiveness Councils respectively: http://ec.europa.eu/environment/gpp/pdf/council_dec2008.pdf; http://ec.europa.eu/environment/gpp/pdf/council_sept2008.pdf

Several market studies on renewable raw materials with a common methodology have been carried out in Germany²⁹, France³⁰, and the UK³¹. They provide information that is useful for the criteria setting process in Green Public Procurement.

Already achieved (a non-exhaustive list with examples)

- A coherent EU policy framework for Green Public Procurement
More info: http://ec.europa.eu/environment/gpp/eu_policy_framework_en.htm
- Toolkit documents for Green Public Procurement for various product categories. The toolkits provide information on methodology, legal guidance, concrete examples of environmental criteria for tender documents.
More info: http://ec.europa.eu/environment/gpp/toolkit_en.htm

Recommendations for action:

a) Measures within the current Green Public Procurement framework

18. Encourage contracting authorities in all EU Member States to give preference to bio-based products in tender specifications. A requirement or a recommendation to give preference can be laid down in a national action plan adopted by the government.
19. Preference should be given to bio-based products unless the products are not readily available on the market, the products are available only at excessive cost, or the products do not have an acceptable performance.
20. Encourage an active exchange of information and experiences (e.g. through public procurement networks) between EU institutions and national authorities in procuring sustainable products and services across all product and service categories. It can be noted that the terms “renewable raw material, biodegradable, recyclable” have been included in some of the EC-toolkit documents to express a preference for bio-based products in tender specifications.
21. Encourage Member States to compare good examples. For instance, the Netherlands have legislated that 100% of the procurement should select sustainable goods and services. Austria has set targets for green public procurement per product segment (IT, electronics, paper, cleaning, vehicle fleet, etc). Encourage setting national or regional targets for green public procurement.
22. The formulation of preferences for goods that meet criteria such as "bio-based", "renewable raw material", "bio-degradable", "recyclable", or "reduced green house gas impact", shall be facilitated by the elaboration of suitable European industry standards and product labels.

²⁹ “Market Analysis Renewable Resources” by Dr. Norbert Schmitz, meóConsulting Team;

http://www.errma.com/new/index.php?option=com_docman&task=doc_download&gid=27&Itemid=24

³⁰ “The Current Market for Industrial Bioproducts and Biofuels & Foreseeable Trends for the Period 2015 / 2030 – Summary” by ADEME / ALCIMED, April 2007;

http://www.errma.com/new/index.php?option=com_docman&task=doc_details&gid=28&Itemid=24

³¹ "Market analysis of key renewable materials and product sectors - Main Report - Volume 1". Report to the National Non Food Crops Centre, UK; <http://www.nnfcc.co.uk>; "Biochemical Opportunities in the United Kingdom"; NNFCC 08-008; http://www.nnfcc.co.uk/metadot/index.pl?id=7934;isa=DBRow;op=show;dbview_id=2539; "Techno-Economic Assessment of the Potential for a PLA Manufacturing Plant in the UK"; NNFCC Project Factsheet: Project No. 08-009; http://www.nnfcc.co.uk/metadot/index.pl?id=7885;isa=DBRow;op=show;dbview_id=2539

23. If bio-based products are compared to conventional products through life cycle assessment, the environmental impact must be measured following a uniform, commonly agreed standard, in accordance with the recommendations of the European Platform on LCA and on the basis of an applicable industry standard.

b) Additional measures to facilitate the uptake of bio-based products

24. Develop a list of product groups and designated bio-based products. The product groups and subgroups reflect the areas of application (e.g. building materials, furniture, cleaning products, lubricants, packaging, etc). The designated bio-based products reflect the individual products from each manufacturer respectively (e.g. "Bio-Hydraulic Fluid" from company "XY").
25. Set the minimum level of bio-based content for each product group in consultation with industry (e.g. hydraulic fluids: 50% minimum bio-based content).
26. The list of product groups, designated bio-based products, and minimum bio-based content should be published in a Commission Recommendation as guidance for contracting authorities. In addition, it may be provided in a searchable on-line database.
27. The lists of product groups and minimum level of bio-based content should be prepared taking into account what has been done with the US BioPreferred Program, to ensure the highest possible international harmonisation of rules and an aggregation of world markets. The process should involve a consultation of stakeholders in Europe.
28. In the absence of a list of designated bio-based products, contracting authorities should be encouraged to indicate in tender specifications that preference will be given to goods and services that meet sustainability criteria (common GPP criteria), including the notion "bio-based content".
29. A continuous exchange of information with the US and other countries on public procurement could help make the European bio-product procurement more successful. The possibility of harmonising standards and labels at the international level should be studied and pursued if feasible.

The development of Green Public Procurement Guidelines is not a result of the Lead Market Initiative, but the LMI provided an impetus to ensure that "bio-based" become part of the common criteria. The recommendations above aim at filling the gaps in current GPP policies and help to speed up the demand for bio-based products.

ACTION 5: STANDARDS, LABELS AND CERTIFICATION

An illustration of the economic value of standards

The current absence of standards for bio-based products causes difficulties for European companies who have developed bio-based products, e.g. bio-plastic or bio-lubricant. Although the markets for plastic and lubricant (gearbox oils, engine oils, etc) are huge, the bio-based novelties cannot easily access these markets, in part because of the cost disadvantage of new technologies, as well as the lack of standards.

Downstream, the lack of standards creates uncertainty for companies willing to use bio-based components, for distributors and for retailers. In turn, the consumers cannot distinguish between conventional plastic and bio-plastic, because of the lack informative product labels (that are based on standards). In addition, bio-based products may have specific characteristics, e.g. biodegradability, recyclability, low toxicity, etc.

Public procurement is another example of a sizeable customer group that today lacks information about the quality, functionality and characteristics of bio-based materials. Standards and voluntary certification systems are ways to facilitate the uptake.

a) Elaborate European standards for bio-based products

The Commission has identified that there is a lack of suitable European standards for bio-based products, in particular for the determination of bio-based content as well as other products capabilities including functionalities, the evaluation of environmental impact, and a number of other purposes.

The absence of standards effectively hinders the market uptake of bio-based products, both on consumer markets and in public procurement. To address this shortcoming, the Commission has in 2008 issued two standardisation mandates for bio-based products:

Mandate 52/2008 (CEN M/429) for the programming of standards for all types of bio-based products:

The programming mandate aims at producing a review of already existing European standards on all types of bio-based products, identifying needed pre-and co-normative research and proposing a work programme for the elaboration of standards which will guide future decisions, including possible future Commission mandates. CEN's indicative timeline is mid-2010.

Mandate 53/2008 (CEN M/430) for the rapid elaboration of pre-standards for bio-lubricants and bio-polymers:

The standardisation mandate calls for European standards to be developed immediately for bio-lubricants and bio-polymers. Technical Specifications will first be prepared as an interim output and those will later be converted into full European Standards (ENs). The European standards should cover the following aspects:

- biodegradability, toxicity and renewability (for bio-lubricants only),
- product functionality,
- impact on greenhouse gas emissions and raw material consumption³²,
- measurement methods, test methods, and Life Cycle Analysis procedures.

CEN has accepted the two mandates and integrated the work into existing Technical Committees and Working Groups, which will allow for efficiency gains and better coordination. The Technical Specifications on bio-lubricants and bio-polymers are planned for publication by mid-2010.

³² PAS 2050 may be used for this purpose.

Already achieved (a non-exhaustive list with examples)

- The revised Regulation on Eco-labelling (the Commission proposal is expected to be adopted in autumn 2009)
More info: <http://ec.europa.eu/environment/ecolabel>
- A searchable catalogue of products qualifying for the EU Eco-label
More info: <http://www.eco-label.com>
- A toolkit for the use of the EU Eco-label on bio-lubricants
More info: http://ec.europa.eu/environment/ecolabel/ecolabelled_products/categories/lubricants_en.htm
- The introduction of life-cycle thinking for an efficient use of resources.
More info: "Thematic strategy on sustainable use of natural resources" (COM(2005) 670 final) and "2009 Review of the European Union Strategy for Sustainable Development" (COM(2009) 400 final).
- The development of an International Reference Life Cycle Data System (ILCD) Handbook
More info: <http://ict.jrc.ec.europa.eu/eplca/deliverables>; to be published autumn 2009

Industry has made self-commitments on:

- biodegradable and compostable polymer products, including standardisation, certification and labelling;
- bio-lubricants self-commitment agreed to be finalised.

Recommendations for action:

30. Develop clear and unambiguous European and international standards. The standards will help to verify claims about bio-based products in the future (e.g. bio-degradability, bio-based carbon content, recyclability, and sustainability).
31. Support existing European standards which have proven to work effectively, e.g. EN 13432 on bio-degradable and compostable materials.
32. Ensure consistency for standards across sectors between various bio-based products.
33. Develop a horizontal standard for the methodology to calculate bio-based carbon content in all materials and products (i.e. the ratio of the two isotopes $^{14}\text{C}/^{12}\text{C}$).

b) Develop a common methodology for sustainability assessment of all products

Recommendations for action:

34. The sustainability assessment should be based on all three pillars of sustainability: environmental, social and economic. While we need (to develop) tools to assess sustainability of products, we need to ensure the tools used will stimulate and not limit the development and implementation of bio-based products.
35. The scope of an assessment methodology should be all products including bio-based products.
36. For bio-based products it is important to take into account the fact that this is an emerging sector using yet maturing technologies that will develop and improve. Comparing bio-based products and non-bio-based alternatives should ensure a level playing field for all products in the market place.
37. Life Cycle Assessments (LCA) should be clear, objective, science-based and easy to handle and implement. LCAs are a tool for improvement of products and processes.

38. Define what key factors should be taken into account (or not) in an LCA and develop a stakeholder agreement on what needs to be considered in an LCA³³ and why. The product life cycle can be divided into clearly defined stages (e.g. cradle to gate, gate to grave, and gate to cradle) to improve the comparability of products.
39. The gathering of LCA data represents an important cost to industry which could be prohibitive for innovative products and/or SMEs. It can also be impossible to provide data for an emerging market. A research effort should be made to cover these gaps and make sensible analysis possible.
40. Sustainability criteria for biofuels have been developed and included in the Renewable Energy Directive³⁴. For bio-based products it has to be verified whether these criteria are also applicable. To ensure coherence between biofuels and other bio-based products, two aspects should be considered for cross-sector harmonisation: (i) the methodology to calculate greenhouse gas (GHG) emissions³⁵, and (ii) the criteria for sustainable biomass production.

The European Commission services (DG Environment, DG Enterprise and DG Research) and the Joint Research Centre are currently developing a guidance handbook for good practice in Life Cycle Assessment³⁶. It will be important to bio-based products: as long as there are different ways to calculate the life cycle of a product, it will be impossible to make a fair comparison of different products and their real impact on the environment³⁷.

Amongst the other important tools, the recently completed CALCAS project³⁸ which was reviewing the basic current paradigms of LCA in order to overcome its present limits was instrumental. It is also important to take into consideration methods for environmental/sustainability assessment already in practice in the industry (e.g. International Environmental Product Declaration³⁹ based on ISO 14021⁴⁰ and 14025⁴¹; SEEBALANCE⁴²; environmental analysis).

The Commission's Joint Research Centre and projects supported under the European Framework Programmes of Research have initiated work on developing a methodology for collecting information about biomass production at farm level. This information will be used to evaluate the total environmental impact of the renewable raw materials used in the production of bio-based products. Thus, the evaluated data can be used in a LCA to make a comparison of products. More results of the project "Whole Farm Geo-Traceability Concept" will be published when the project reaches its interim stage.

³³ For example, Consequential LCA (CLCA) provides information about the consequences of changes in the level of output (and consumption and disposal) of a product, including effects both inside and outside the life cycle of the product. CLCA models the causal relationship originating from the decision to change the output of the product, and therefore seeks to inform policy makers on the broader impacts of policies which are intended to change levels of production. Source: "Technical paper; Consequential and attributional approaches to LCA: a guide to policy makers with specific reference greenhouse gas LCA of biofuels", by Brander, Tipper, Hutchison, and Davis, ecometrica press, April 2008.

³⁴ European Parliament document reference P6_TA(2008)0609

<http://www.europarl.europa.eu/sides/getDoc.do?type=TA&language=FR&reference=P6-TA-2008-0609>

³⁵ PAS 2050 may be used for this purpose.

³⁶ "International Reference Life Cycle Data System (ILCD) Handbook" available on:

<http://lca.jrc.ec.europa.eu/EPLCA/deliverables.htm>

³⁷ The concept of sustainability may involve a combination of factors including e.g. environmental, social, and economic. The purpose of developing guidelines and standards is to establish a common methodology for the sustainability assessment.

³⁸ www.calcasproject.net

³⁹ www.environdec.com/pageId.asp

⁴⁰ www2.ademe.fr/servlet/list?catid=17517

⁴¹ www.iso.org/iso/fr/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=38131

⁴² <http://www.basf.com/group/corporate/en/sustainability/eco-efficiency-analysis/seebalance> and www.dantes.info/Tools&Methods/Environmentalassessment/enviro_asse_EcoEff.html

c) Labelling and information to consumers

The benefits of bio-based products need to be communicated to consumers, in order to build a positive image. European consumers are increasingly making purchasing decisions based on ethical or environmental considerations. New buying patterns give signals to retailers and manufacturers that factors other than quality and price are important.

Product labels should give clear and reliable information about the environmental performance of bio-based products. Wild claims and a growing thicket of "self-made" labels need to be counteracted. This depends on the availability of European standards.

The European Eco-label now also covers bio-based products in various product groups (e.g. lubricants, detergents, plastics). The label sets environmental requirements for products on the basis of the net environmental balance between the environmental benefits and burdens, including health and safety aspects, at the various life stages of the product⁴³.

Two important issues are (i) to stimulate the use of the European Eco-label for products made from renewable raw material, and (ii) to inform consumers about the meaning of the label.

An obvious problem is that there are many different "eco-labels" used in the EU Member States and that the definitions and certification procedures differ widely⁴⁴. Consumers are generally better aware of their national label than the European. Thus, there are significant efficiency gains in promoting a harmonisation of the eco-labels in the medium term.

Recommendations for action:

41. Begin a reflection process on what types of specific product labels are suitable for bio-based products and what information to be given to the consumer.
42. Harmonise the labelling of new bio-based products to reach the market.
43. Review the existing eco-labelling systems in Europe, including national, European and other labels. The existing European Eco-label should be developed and improved further and be used as far as possible.

ACTION 6: COMMUNICATION AND AWARENESS

It is important to promote and raise awareness of the benefits of bio-based products. For this reason, a broad communication initiative is needed to make sure that bio-based products will compete in the market as early as possible.

The strategy for bio-based products includes increasing the visibility of bio-based products by emphasizing their benefits, special capabilities and showing their availability on the market.

The results of the market studies on renewable raw materials in Germany⁴⁵, France⁴⁶, and the UK⁴⁷ can deliver guidance for an information campaign.

⁴³ http://ec.europa.eu/environment/ecolabel/index_en.htm

⁴⁴ Bio Intelligence Service for ADEME (French Environment and Energy Management Agency): "Quality marks and labelling of products that incorporate renewable raw materials – evaluation of needs and comparison of existing methods promotion of bioproducts and biomaterials – summary report", December 2007.

⁴⁵ "Market Analysis Renewable Resources" by Dr. Norbert Schmitz, meoConsulting Team;
http://www.errma.com/new/index.php?option=com_docman&task=doc_download&gid=27&Itemid=24

⁴⁶ "The Current Market for Industrial Bioproducts and Biofuels & Foreseeable Trends for the Period 2015 / 2030 – Summary" by ADEME / ALCIMED, April 2007;
http://www.errma.com/new/index.php?option=com_docman&task=doc_details&gid=28&Itemid=24

⁴⁷ "Market analysis of key renewable materials and product sectors - Main Report - Volume 1". Report to the National Non Food Crops Centre, UK; <http://www.nnfcc.co.uk>; "Biochemical Opportunities in the United Kingdom"; NNFCC 08-008; http://www.nnfcc.co.uk/metadot/index.pl?id=7934;isa=DBRow;op=show;dbview_id=2539; "Techno-

The Commission recognised in its 2007 report⁴⁸ the importance of improving communication and awareness about bio-based products, and the Advisory Group recommends the Commission to elaborate such a strategy.

Eurobarometer survey

A regular Eurobarometer survey will in 2009 include questions on the public perception of bio-based products. The report will be available in the autumn of 2009.

ACTION 7: FINANCING AND FUNDING OF RESEARCH

Already achieved (a non-exhaustive list with examples)

- The mapping of biorefineries and related support policies in the EU.
More info: www.bio-economy.net
- Joint call for bio-refinery research under FP7 in 2008-2009.

a) Mapping of bio-refineries in Europe

The action plan for bio-based products indicates that the Commission and stakeholders should promote the establishment of strategically important bio-refinery pilot plants and demonstrators involving all actors and investments at EU, national and regional level.

As part of the Bio-based Products Lead Market, a mapping of existing bio-refineries at pilot plant or demonstrator scale in Europe has been carried out and the results per country have been published on a web site⁴⁹. The mapping has been made possible with the help of FP7 funding and was carried out in collaboration between EuropaBio and the Commission's two expert groups COMP-BIO-NET and KBBE-NET⁵⁰. The internet site www.bio-economy.net will be successively developed as more information is gathered.

The mapping covers both existing bio-refinery pilot plants and related public policies in the EU Member States. It can be used as a tool to promote the production of various bio-chemicals and bio-materials. Up to this point, there was no harmonised information on how many installations are already up-and-running in Europe.

An earlier mapping of industrial biorefineries in the EU (not solely pilot plants) was conducted within the project Biorefinery Euroview⁵¹ and Biopol⁵². The outcome of this mapping will be published when ready. In addition, Biorefinery.nl⁵³ has published a status report in 2007 on biorefineries⁵⁴.

Recommendations for action:

44. Continue to stimulate and enhance technological innovation and the development of technology: setting up demonstration projects via public-private partnerships.

Economic Assessment of the Potential for a PLA Manufacturing Plant in the UK"; NNFCC Project Factsheet: Project No. 08-009; http://www.nnfcc.co.uk/metadot/index.pl?id=7885:isa=DBRow;op=show;dbview_id=2539

⁴⁸ "Accelerating the development of the market for Bio-based Products in Europe" prepared in connection with the Communication on the Lead Market Initiative (COM(2007) 860 final).

http://ec.europa.eu/enterprise/policies/innovation/files/lead-market-initiative/rep_bio_en.pdf

⁴⁹ http://www.bio-economy.net/bioeconomy/member_states/index_bioeconomy_member_states.html

⁵⁰ Competitiveness in Biotechnology Network (COMP-BIO-NET) and Knowledge-based Bio-Economy Network (KBBE-NET)

⁵¹ www.biorefinery-euroview.eu

⁵² <http://www.biorefinery.nl/biopol>

⁵³ Biorefinery.nl is a joint initiative of Wageningen University and Research Centre (WUR) and the Energy research Centre of the Netherlands (ECN), supported by SenterNovem.

⁵⁴ <http://www.biorefinery.nl/uploads/media/StatusDocumentBiorefinery2007final211107.pdf>

b) FP7 joint call for biorefinery research

Biorefinery research is a priority in the European Union's Seventh Framework Programme for Research and Technological Development (FP7). Related research is supported by four themes of the Cooperation Specific Programme, namely Theme 2 – Food, Agriculture and fisheries, biotechnology, Theme 4 – Nanosciences, nanotechnologies, materials and new production technologies, Theme 5 – Energy and Theme 6 – Environment.

In the autumn 2008 a joint call involving these four themes was published, which invited the research community to put forward multidisciplinary proposals. The call allocated €57m to finance a limited number of large collaborative projects and a coordination and support action. It aimed at developing inter alia bio-based chemicals and at demonstrating the performance, sustainability and viability of the proposed biorefinery concepts.

In the Collaborative Project topic, three proposals have been put on a priority list proposed for funding. All proposals cover integrated multi-feedstock (including forestry, organic waste, algae and other agricultural or energy crops based biomass) and/or multi-product biorefineries, with varying production approaches and final products. Industrial participation in the selected proposals is high involving both large industry and SMEs. Negotiations started in August 2009 and the grant agreements are expected to be signed end of 2009 or beginning of 2010. Successful applicants of the Coordination action topic have also been invited to negotiations.

More info about the calls:

http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.CooperationDetailsCallPage&call_id=150

http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.CooperationDetailsCallPage&call_id=166

c) Access to finance

The Commission mentioned access to finance as an important issue in its Communication on the Lead Market Initiative. The Advisory Group recommends to develop concrete actions as soon as possible. All aspects related to financing should be treated, e.g.:

- financing of SMEs (such as risk capital),
- research funding to develop innovative bio-based products and biorefineries
- financing for translational research and demonstration projects in order to translate knowledge into products and to shorten access to market.

TAKING BIO-BASED FROM PROMISE TO MARKET

Measures to promote the market introduction of innovative bio-based products

A report from the Ad-hoc Advisory Group for
Bio-based Product in the framework of the
European Commission's Lead Market Initiative

Published 3 November 2009

ISBN 978-92-79-14056-3

