InnProBio
FORUM FOR BIO-BASED INNOVATION IN PUBLIC PROCUREMENT

Factsheet No. 2

# Sustainability of bio-based products

Bio-based products are made from renewable feedstocks such as wood, straw, sugar, maize, cassava, algae or biowaste ('biomass' can be used as an umbrella term). Products made entirely or partially from biomass present an alternative to products solely produced by conventional and non-renewable resources – that is petroleum, coal, natural gas – and thus present the potential for a long-term shift away from fossil-based towards a bio-based economy. However, in order to be sustainable, a non-fossil feedstock base is not enough. Other aspects, such as agricultural practices for the cultivation of the biomass, energy used in the production process, process agents such as chemicals, solvents, etc. have to be considered to ensure that a product is sustainable across its life cycle. On the other hand, bio-based products can offer improved functionalities with reduced greenhouse gas (GHG) emissions, less toxicity, less waste and better end-of-life options for final disposal.

## Feedstocks

The choice of feedstock can have a huge impact on the overall sustainability of a bio-based product: agricultural cultivation often uses significant amounts of water, fertilisers, and pesticides. Working conditions on the fields might not be compliant with international labour standards. Or, in the case of wood, forestry practices may not be in line with sustainable forestry. On the other hand, bio-based feedstocks replace fossil-based materials, which are often sourced by technologies that are very detrimental to our environment (e.g. fracking, oil sands or oil spills through accidents) and can have severe impacts on society, too. The right bio-based feedstock for a product can be land and resource efficient, save on emissions and be a good substitute for finite resources.

How to make sure that bio-based feedstocks are sustainable? See the section on "Certification and labels".

## End-of-life of bio-based products – issues regarding biodegradability, recyclability, etc.

Bio-based products offer alternative end-of-life options compared to their conventional counterparts, but can also enter traditional disposal routes, such as recycling or incineration. Depending on the product's use, not all end-of-life options make sense from an environmental perspective. Bio-based products can be biodegradable, which can set them apart from many conventional products and can be beneficial in many ways, since new biomass can be won from it and the resource can be used several times. If bio-based products go into a process of anaerobic digestion after their lifetime,



biogas can be generated and what remains can be used as nutrients for agricultural purposes. However, recyclability is also a very important issue for sustainability, and processing energy demand as well as transport to composting facilities also needs to be taken into consideration when deciding on the most suitable end-of-life option.

Furthermore, not all biodegradable products biodegrade under the same conditions. Often, high temperatures are necessary, and in almost all cases biodegradability does not mean that products will degrade in the open environment, such as on the ground or in water, but require controlled environments in order for this to happen (as in e.g. industrial composting). As one example, biodegradability makes sense within a closed system, but not necessarily in mixed waste streams. For instance, for a hospital which has integrated anaerobic digestion facilities that can provide energy directly to the hospital while keeping potentially contaminated products on site, the use of biodegradable products can provide benefits in functionality and for the environment. See *Factsheet #3 on Biodegradability* for more information.

## Measuring environmental impacts – Life Cycle Assessment (LCA) and Product Carbon Footprint (PCF)

### Greenhouse gas (GHG) emissions

The production and use of products and services can cause different gases to be emitted into the atmosphere. According to the Kyoto Protocol, the six most relevant gases are carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride ($SF_6$). They are responsible for absorbing and emitting radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This can result in an increase of global temperatures, commonly referred to as the greenhouse effect, with the mentioned gases often referred to as GHG.



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### Life cycle assessment (LCA)

LCA is an international standardised methodology used to evaluate a product's impact on the environment over the entire period of its life – from cradle (that is, from raw material extraction) to grave (that is, disposal or recycling, etc.).

GHG emissions are one aspect of an environmental LCA to show the impacts related to the global warming of the Earth's atmosphere. Other environmental impact categories that can be considered are non-renewable energy use, fossil resources depletion, eutrophication, acidification, etc.

LCAs can be helpful in a public procurement process to evaluate the inputs, outputs and potential environmental impacts of purchasing a particular product throughout its life cycle. Life cycle considerations of products and/or materials are included as part of some eco-labels, namely type I and type II eco-labels. LCAs are important for establishing the sustainability case for bio-based products – thus more information will be available in the InnProBio *Factsheet #5 on LCA*.

### Product carbon footprint (PCF)

A carbon footprint measures the total GHG emissions caused directly and indirectly by a person, organisation, event or product. A carbon footprint is measured in tonnes of carbon dioxide equivalent ($tCO_2e$) and considers the six Kyoto Protocol GHGs. A PCF is a means for measuring, managing and communicating GHGs related to goods and services. They cover emissions over the whole life of a product or service, from the extraction of raw materials and manufacturing process right through to its use and recycling or disposal. A carbon footprint is generated based on LCA but focuses on a single issue: global warming.

## Certification and labels

Sustainability certifications and labels can help public procurers to define their requirements regarding bio-based products in their public tenders.

Under the new EU Public Procurement Directives (2014) contracting authorities have the possibility of using labels as a source of information for defining technical specifications or award criteria. Labels also offer a sure way to procurers to check compliance with these requirements, by accepting the label as one means of proof of compliance with the technical specifications, for instance. Further details governing the requirements for using labels in public procurement are provided in the Directives themselves and in the European Commission's latest guidance on green public procurement:

the "Buying Green!" Handbook – the third edition was published in April 2016.

The following is a (non-exhaustive) list of different labels, certification schemes and standards that may be considered when purchasing bio-based products or services:

### ISO 14024 Type I Ecolabels specifying bio-based products:

- EU Ecolabel ("the Flower"):
  **Lubricants:** Lubricants receiving the EU Ecolabel need to prove a minimum content of bio-based carbon between >45% and >70% (depending on the type of lubricant). More information is available here.
- Nordic Ecolabel ("Nordic Swan")
  **Sanitary products:** This product group includes bio-based materials in the form of fluffy pulp and bio-based polymers. Material composition must either include a share of 7% of all polymers from renewable raw materials, a share of 50% of all materials derived from renewable resources or the global warming potential of all the materials cannot be above 2.1 kg $CO_2$-equivalents/ kilogramme of the product. More information is available here.
  **Disposables for food:** A minimum of 90% by weight of the product must be produced from renewable raw materials (except for inorganic fillers which can make up to 20% of the product). More information is available here.
- **Blue Angel ("Blauer Engel"):**
  **Office materials** (writing utensils and stamps): A very recent revision of the criteria for these products has included the provision that they need to be produced either from 60% renewable raw materials or from 80% recycled materials. More information is available here (in German).

## Private, third-party certifications for different aspects:

### Sustainable feedstocks

The cultivation of renewable resources (usually from forestry and agriculture, sometimes from marine aquaculture) has a huge impact on the sustainability of the final bio-based products. Due to the EU's renewable energy policy, a multitude of certifiers have developed certification schemes for agricultural biomass that adhere to the conditions laid down in the EU's Renewable Energy Directive (RED). Most of them have by now adapted their schemes in a way that they can be applicable also to materials, not only to energy. For wood, sustainability certification schemes were developed before the renewable energy policy due to concerns about unsustainable forestry practices in many parts of the world.




- Wood
  - Forest Stewardship Council (FSC)
  - Programme for the Endorsement of Forest Certification (PEFC)
- Agricultural biomass
  - International System for Carbon Certification (ISCC and ISCC+) – all agricultural biomass
  - Roundtable on Sustainable Biomaterials (RSB) – all agricultural biomass
  - REDcert – all agricultural biomass
  - Better Biomass – all agricultural biomass
  - Roundtable on Sustainable Palm Oil (RSPO) – only palm oil
  - Bonsucro – only sugar
  - Roundtable Responsible Soy (RTRS) – only soy

A report from WWF assessing the different certification systems, comparing strictness, etc. is available here.

### Bio-based content

Existing certification of bio-based content refers to bio-based carbon and is based on the American standard ASTM 6866 "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis", but also refers to CEN TS (technical specification – not the same as a standard) 16137 "Plastics – Determination of bio-based carbon content". Once the European standards on bio-based content have been finalised and published, it is expected that European certification bodies will also consider them.

- OK biobased (owned and awarded by Vinçotte)
- DIN-Geprüft Biobased (owned and awarded by DIN CERTCO)

### End-of-life options

There are some private, third-party certifications and labels that highlight possible special end-of-life options of bio-based products, such as compostability, biodegradability in soil, biodegradability in sea water, etc. For clarification on these terms, please have a look at the InnProBio *Factsheet #3 on Biodegradability*. The following are the three most popular certifications used in Europe to prove compliance with the compostability norm EN 13432.

- Industrial compostability
  - The Seedling (owned by European Bioplastics, awarded by DIN CERTCO and Vinçotte)
  - DIN-Geprüft Industrial Compostable (owned and awarded by DIN CERTCO)
  - OK compostable (owned and awarded by Vinçotte)

For an overview of all globally available logos demonstrating compostability, see a summary report of the KBBPPS (Knowledge Based Bio-based Products' Pre-standardization) project on compostability standards.

- Home compostability
  - OK home compostable (owned and awarded by Vinçotte)
  - DIN-Geprüft Home Compostable (owned and awarded by DIN CERTCO)
- Biodegradability in soil
  - OK biodegradable soil (owned and awarded by Vinçotte)
  - DIN-Geprüft biodegradable soil. (owned and awarded by DIN CERTCO)
- Biodegradability in sea water
  - OK biodegradable marine (owned and awarded by Vinçotte)

InnProBio seeks to build a community of public procurement practitioners interested in the procurement of bio-based products and their associated services. This factsheet series aims to provide concise information on topics of relevance to public procurement of bio-based products and services.

**Partners:**

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