



The Plastic Challenge

Roadmap to Bioplastics

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Content

1	Waste & resource management.....	6
2	Packaging & waste: A long history	7
3	Biodegradable or compostable?	8
4	Biobased, biodegradable or compostable?	10
5	Certification of bioplastics	12
6	For or against?	13
7	From certification to communication	14
8	Biodegradables: Mapping an innovative future	16
9	Bibliography	17



1 Waste & resource management

The issue of the climate forms part of every discussion today. Not a day passes without an article in the newspapers or on social media without comments on what until recently has been called global warming and which is inexorably turning into a climate emergency.

Nor does a day pass without images of rivers of plastic pouring into the seas.

We must do something. It's probably still not too late but it's time, not to save the planet, which has survived much more violent and radical episodes, but to save mankind, which is a lot more fragile than the planet which shelters it.

We are deluding ourselves if we believe or convince others that we can tackle these problems without modifying our behaviour. The longer we wait, the more drastic and restrictive these behavioural modifications will be.

This set of problems is extremely complex and the answers are many. So there is no universal, global and absolute solution. There are however a large number of measures that citizens, politicians and organisations can implement to influence this change locally or more generally.

Two aspects have been of special interest to us for many years: waste management and resource management.

“OK compost has been developed to meet a requirement by civil authorities.”



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2 Packaging & waste: A long history

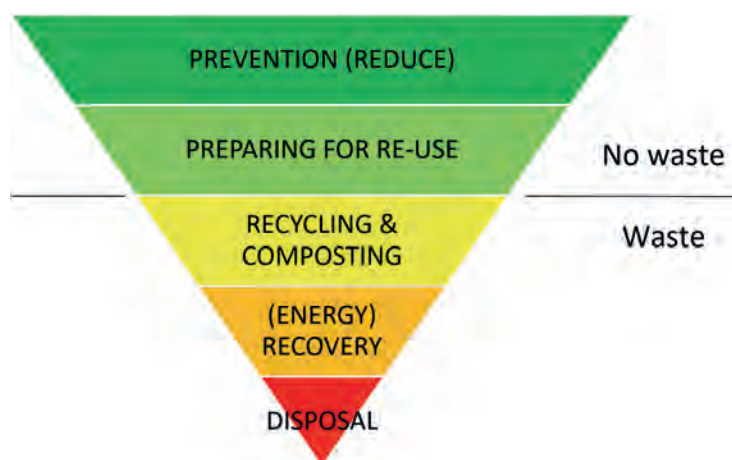
It all began at the start of the 90's when the port city of Antwerp in northern Belgium decided to organise selective collection of green waste within the framework of the "Packaging and packaging waste" European Directive¹. Local authorities, which considered it logical to collect garden waste in compostable bags, encountered numerous quotations from manufacturers of bags that they claimed were compostable without being able to verify this scientifically. So the city turned to the main Belgian certification body² to help it choose between the quotations. This ad hoc request gave rise to the idea of a certification system associated with a logo: OK compost³ was born and the first certificates were signed in May 1995.

The range of certified products expanded very rapidly from collection bags to shopping bags/checkout bags, to fresh food packaging and then to catering items, more specifically in the fast food sector. In fact, composting items contaminated with food residues makes sense and offers an economically viable alternative to incineration, since the presence of these moist food residues greatly reduces the energy efficiency of incineration while improving the composting process.

It is evident, and no-one can dispute this, that the best packaging is the one that does not exist.

But packaging is nonetheless indispensable in some cases and has above all a protective function, like the skin of a fruit. Without this protection, food would degrade too quickly, in particular in transit and on shelves.

That being said, as soon as a piece of packaging becomes necessary, in so far as it is designed to be reusable and, if it cannot or can no longer be reused, we should make adjustments so that it can be recycled, the ultimate solution being incineration (with energy recovery) or disposal/landfill.



In the hierarchical pyramid of waste treatment, composting sits at the same level as recycling.

Over time, the range of marks of conformity has expanded to other environments where waste might occur: household compost (OK compost HOME), or biodegradability in nature (OK biodegradable SOIL, WATER and MARINE).

¹ Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste

² TÜV AUSTRIA took over the certification activities for bioplastics from Vinçotte in 2017

³ To clarify, *OK compost* became *OK compost INDUSTRIAL*

3 Biodegradable or compostable?

Biodegradability is the intrinsic characteristic of a material of chemically degrading through the action of microorganisms present in a given environment, mainly characterised by the temperature, the humidity and the organisms present.

Other factors might cause the degradation or fragmentation of a product but then we could not speak of biodegradation⁴.

Compostability is the characteristic of a finished product manufactured using biodegradable materials of (physically) disintegrating within a given period without any toxic effects on that environment.

These conditions are simulated in the laboratory to obtain measurable and reproducible results, regardless of the time or the laboratory used.

“A biodegradability statement must always be associated with the environment in which it may occur.”

To communicate about end-of-life treatment as clearly as possible, we have developed two families of marks of conformity: OK compost and OK biodegradable, classified into as many versions as there are possible environments.

The OK compost family presupposes that there is human intervention during the end-of-life treatment in an industrial composting centre or in household composting as well as a concept of a time lag for the disintegration and biodegradation.

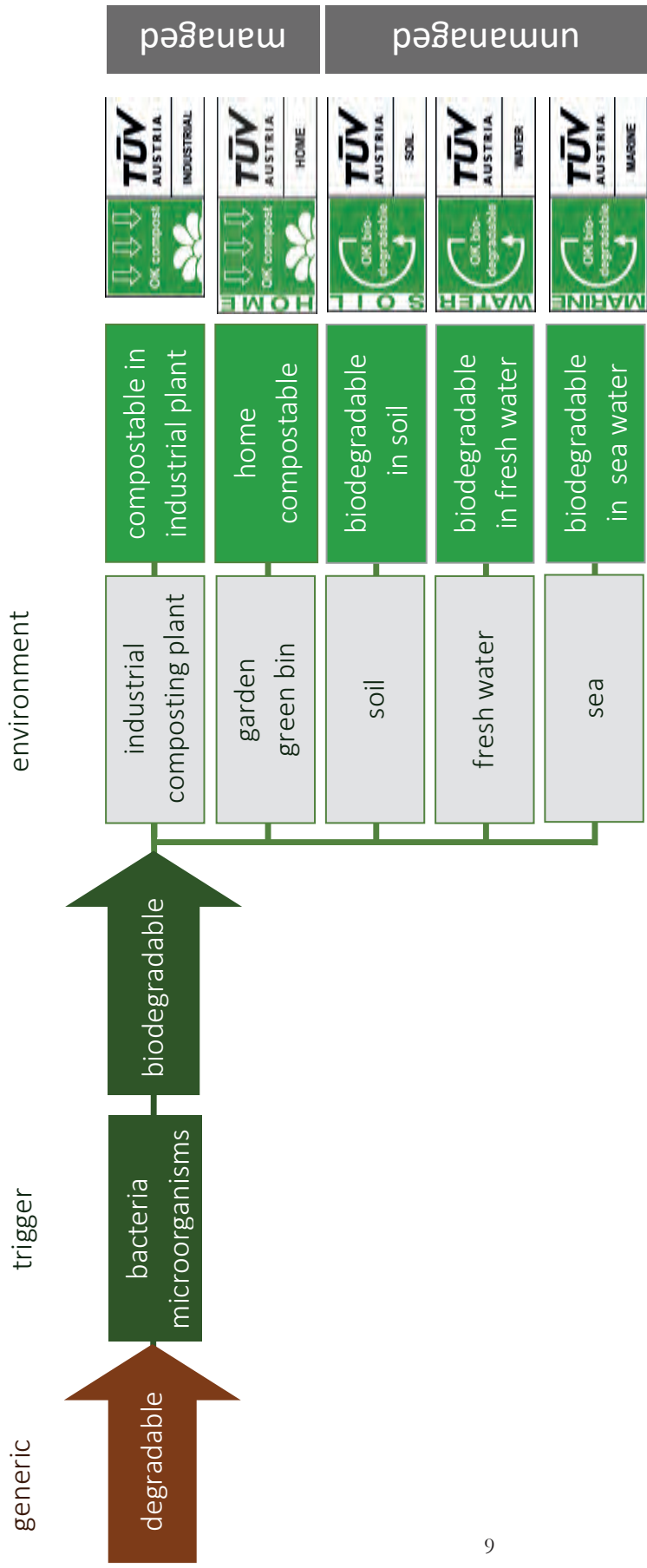
In contrast, the OK biodegradable family requires no intervention, nature taking care – since time immemorial – of the job.

In this sense, a tree is biodegradable but not compostable since it does not disintegrate within the time limits. The test and certification criteria are therefore more binding for bioplastics than nature is for natural products.



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⁴ Such as oxo-degradable plastics that will be banned in Europe by the Single Use Plastics Directive.



Each environment has its corresponding characteristics and logo.

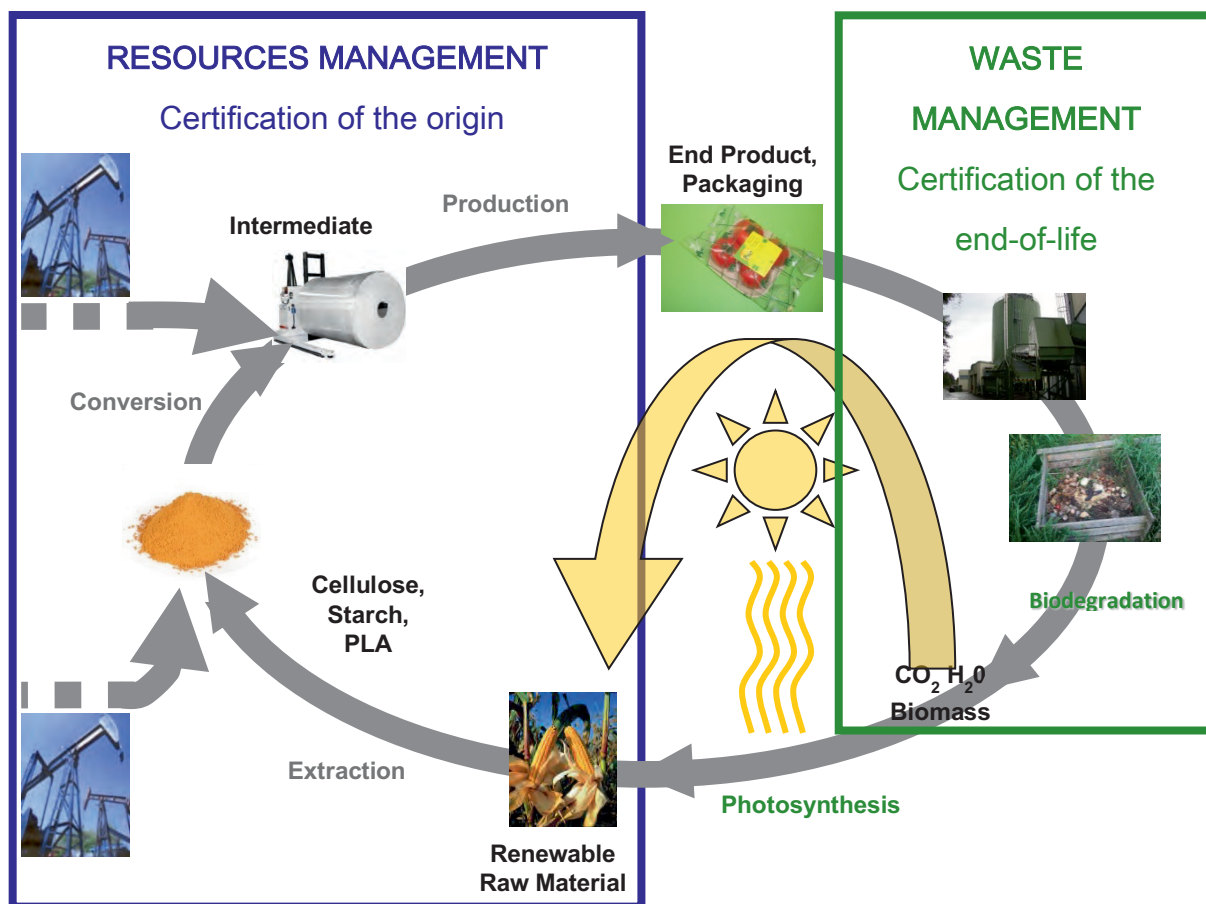
4 Biobased, biodegradable or compostable?

In 2006, Al Gore, the ex-US Vice President and 2007 Nobel Peace Prize winner (with the IPCC⁵), published his manifesto⁶ which went on to give rise to a new idea: To date we have dealt with the various flows of end-of-life treatment of waste but what about the origin of these materials? This consideration gave birth - after 3 years of development – to the OK biobased⁷ mark of conformity in 2009.



The concept of “biobased”, a frequent source of confusion, refers to the natural, contemporary and renewable origin of products (= of plant origin) as opposed to fossil and non-renewable resources (= petroleum).

But it should be noted that the fact of being biobased does not in any way confer a capacity to biodegrade to the product concerned. These are two completely independent characteristics.



In the lifecycle of bioplastics, biobased and biodegradable are two independent characteristics, regardless of the biobased proportion of the product.

⁵ Intergovernmental Panel on Climate Change

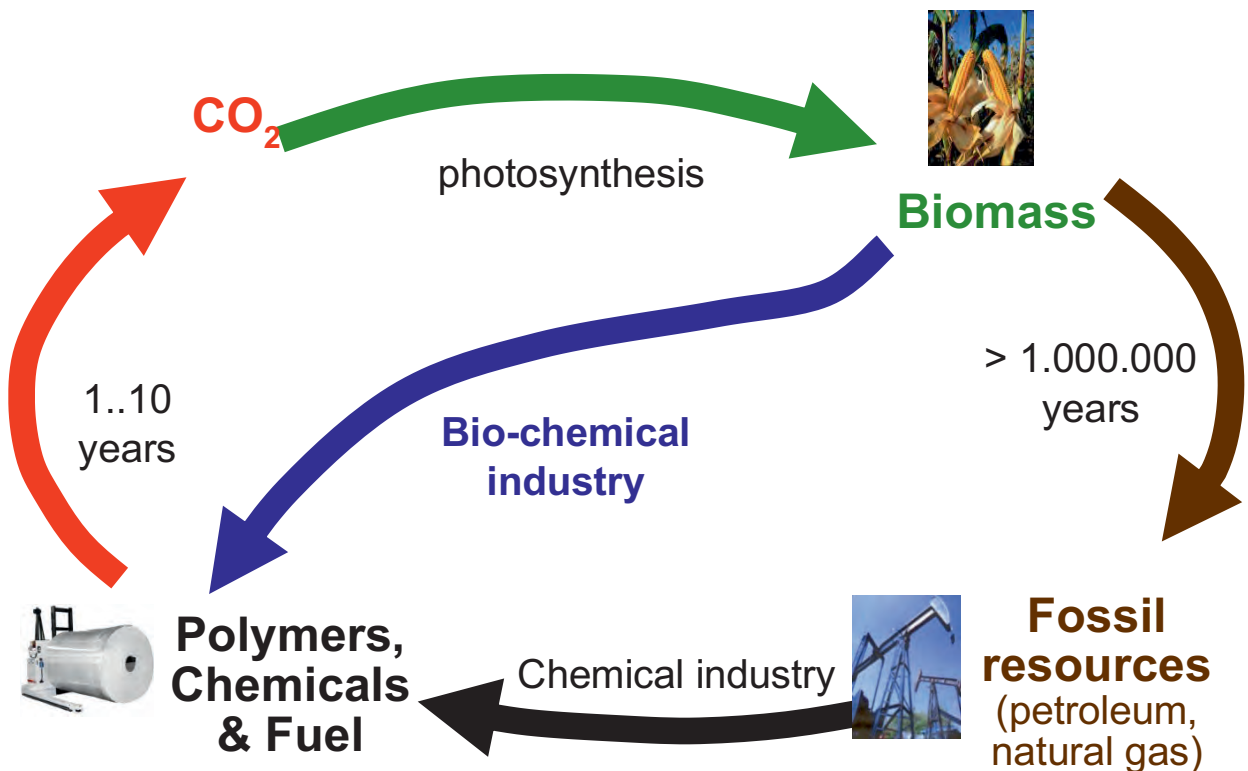
⁶ An Inconvenient Truth – Al Gore - 2006

⁷ Reference standards: ATSM D6866 / EN 16640

For example, in its most familiar form, the polyethylene used for manufacturing bags is of fossil origin but a biobased version based on sugar cane has been available on the market for several years. Nothing distinguishes these two materials chemically and their composition is absolutely identical. Only carbon 14⁸ allows us to tell them apart but neither of them is biodegradable.

We might consider the biochemical industry as a temporal shortcut. No need to wait millions of years to obtain petroleum to be transformed into plastic by conventional petrochemical techniques. The advantage of this short cycle is indisputable. Whatever the end-of-life treatment, the CO₂ emissions were captured only recently. It is a short cycle, therefore slowing down the harmful increase in the level of CO₂ in the atmosphere originating from the greenhouse effect with its well-known consequences.

“Biobased and biodegradable are two completely different concepts. Being biobased does not by any means automatically imply biodegradable.”



Source : Ramani Narayan (Michigan State University)

The use of biobased resources allows the carbon cycle to be shortened and avoids releasing into the atmosphere CO₂ captured millions of years ago. Measuring carbon 14 allows us to determine the fossil and biobased proportions.

⁸ For more details, see our website http://www.tuv-at.be/fileadmin/user_upload/docs/download-documents/english/Doc_29e-a_-_C14.pdf

5 Certification of bioplastics⁹

Product certification is based on performing laboratory tests in accordance with international standards. Every raw material or resin is subjected to tests aimed at verifying its characteristics compared with a given reference. The latter is based on international standards, where they exist.

Where such standards do not exist, we have created our own references and we have had them verified by a committee of experts consisting of representatives of the various sectors involved. This is in particular the case with our OK compost HOME technical specification developed in 2003, whose criteria served as a reference¹⁰ for an Australian standard in 2010, a French standard in 2015 and lastly the future European standard for household compostable bags.

All these evaluation processes must be plausible. To that end, the certification body must be impartial and competent and must base its judgement and conclusions on measurable, indisputable and reproducible facts. It is not a matter of a value judgement or an opinion but facts even if, as we must acknowledge, it is not possible to work in this domain without being convinced of the real added value of biodegradable/compostable and/or biobased products.

Much more than a simple snapshot showing conformity at an instant, our certification systems provide constant monitoring of the market throughout the life of the certificate¹¹.

“Every finished product must be subjected to a conformity evaluation even if the resin used is certified.”

In the event of non-conformity, corrective measures are imposed, regardless of the scale of the client and where in the world they are located. If the non-conformity is serious and puts the reputation of the mark and the good name of the certification body at risk, the measures will be immediate and drastic.

Any misuse of the logos will also automatically be subject to legal proceedings.

⁹ In the context of this document, the term “bioplastic(s)” refers without distinction to compostable, biodegradable and/or biobased products made of biopolymers and/or natural products.

¹⁰ AS 5810 (2010) ; NF T-51800 (2015) ; prEN 17427 (2019)

¹¹ List of valid certificates on <http://www.tuv-at.be/certified-products/>

6 For or against?

In this area, as in some others, there are those in favour and those against. When electrical safety is being discussed, voices are rarely raised against better protection for the users of domestic appliances. Some people consider the cost of tests and certification prohibitive but in reality, it is the cost of conformity and not the cost of demonstrating it that is greater.

It must be ensured that in the area of bioplastics, as in all technological advances¹², the positions taken, which are often emotional, are firmly held.

As stated above, if we can do without packaging, we should do so. But when we cannot, it is then important to put forward solutions that are financially and environmentally advantageous. Compostability can be such a solution in some cases.

The use of agricultural resources to produce biobased packaging also has several advantages (carbon sequestration, new opportunities for farmers and making use of unused land) but it cannot be considered a universal solution.

Refusing to accept compostable or biobased solutions on the pretext that they would replace products that would simply have to be banned can only lead to failure. In order for the solutions proposed to be effective and actually applied, they must take into account the needs of the entire population.



National Trust's Lizzy Carlyle presents the organisation's compostable magazine wrapping. Photo: James Dobson. Right image: Italian food producer ZUEGG ships its juices in TÜV AUSTRIA OK compost-certified packaging. Photo: Georg Trummer.

¹² Artificial intelligence, genetically modified organisms, driverless cars etc.

7 From certification to communication

Our profession has evolved over time, especially in recent years. From assessors of conformity, we are increasingly becoming the vector of communication. We want to go further than the “simple” assessment of conformity, towards becoming a reference point, and we want to support our clients in their deliberations and to guide their communication.

In response to an increase in demands of all types, we have developed a “certification & communication” approach that allows us to reply to the most unusual questions: Can T-shirts, office accessories, electronic articles or toys be certified compostable? Biodegradable? Biobased?

We think that many of these products are eligible but not necessarily actually certifiable¹³ - but that communication of this characteristic (compostable/biodegradable/biobased) must be properly managed. However, these characteristics cannot be used to communicate just any way.

On the basis of our experience, we have established a classification of products based on the potential end-of-life environments, be they ethically acceptable or otherwise. We have thus identified 4 end-of-life flows.

1. INTENDED

Products intended to end their lives in a certain environment and specifically designed with this in mind. The logo attached to the product may serve as a collection instruction for the citizens of certain regions or to demonstrate conformity with the national legislation in certain countries.

For example: Bags and packaging containing compostable waste¹⁴ (OK compost), mulching films (OK biodegradable SOIL) or dishwasher tablet packaging (OK biodegradable WATER).

2. EXPECTED

Products which, because of their function, stand a high chance of ending up in this environment despite the fact that they bring no real added value to it. There is a risk but their intrinsic biodegradability is genuinely advantageous since this reduces their end-of-life impact, although communication must be adapted so to provide guidance to the consumer.

Example: Fishing net (biodegradation in the sea) or golf tee (biodegradation in the soil)

3. ACCIDENTAL / INAPPROPRIATE

Products that find themselves in this environment by chance or as a result of inappropriate (human) conduct. The fact that they are biodegradables reduces their impact but communication is strictly limited to avoid littering. Example: Fireworks (biodegradation in the soil), shopping bags in the river or in the sea.

4. UNAVOIDABLE

Products which, mainly because of their size, are inevitably going to end up in the soil or the sea¹⁵. These are mainly very small-scale elements and their biodegradability reduces the micro-plastic problem. However, in order to avoid wrong messages (and littering), the finished products from which they are made cannot claim to be biodegradable. Example: paints, particles from tyres or textile fibres that end up in the soil or sea.

¹³ A pen, for instance, cannot be certified compostable because of the presence of certain non-biodegradable components.

¹⁴ These products are covered by the area of application of Harmonised European Standard EN 13432 regarding industrial composting and/or the French standard NF T 51-800 for household composting.

¹⁵ 20% of the 950,000 tons of microplastics thrown in the sea every year come from textiles (Eunomia, *Plastics in the marine environment*, 2016)

Many products are eligible, not all are certifiable and, for some of them, communication will be limited to avoid littering.

The type of communication authorised (logo on the product or on the packaging or advertisement on the website or in commercial documentation) depends directly on the environment concerned and on the product class.

So, fruit and vegetable packaging will logically be considered as “intended” for industrial or household composting but “inappropriate” for biodegradability in the natural environment. An OK compost HOME-certified bag, for example, can bear the logo on an ad hoc basis.

On the other hand, even if it is OK biodegradable SOIL-certified, this same bag cannot be declared as such and cannot be marked with the logo to avoid littering. Nevertheless, its ability to biodegrade in the soil must be considered real added value, in the event that this packaging finds itself in the soil by accident or as a result of inappropriate conduct.

This approach might appear commercially counterproductive for a certification body but TUV AUSTRIA is convinced that such an approach, which contributes to combating greenwashing and false declarations, can in the long run only be beneficial to the sector and the environment. Even if that means losing some clients.

Beyond certification, we therefore would like to make our clients think by making them assess the bases of their conduct.



8 Biodegradables: Mapping an innovative future

It's a long time since the days of the collection of the first garden waste bags with their insipid and soggy appearance. Today it's all refined and complex products with qualities and properties not even imagined a short while ago.

New polymers are being developed, ones benefiting from synergistic effects or using enzymes to improve biodegradability.

All these new technologies create constant new ideas that drive us to develop new approaches to meet changes in the market in terms of tests, assessment of conformity and market monitoring.

To this end, we are participating in many exhibitions, conferences and thinktanks and standardisation committees. It is there that we get together with our clients and various associations and NGOs to understand their respective positions and to offer realistic and plausible solutions to their challenges.



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