

# Material Flows of the Bioeconomy: Impact of the Regulatory Framework

# Bioplastics

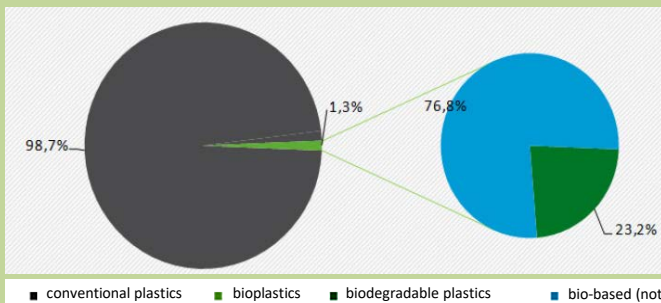
This **fact sheet** discusses properties of bioplastics as a packaging material, its **regulatory framework** and **obstacles** which result from it. **Recommendations** to foster renewable materials from scientific literature are collected and evaluated.

## INPUT & PROPERTIES OF BIOPLASTICS [3, 17]

Not biodegradable		Bio-based & Biodegradable			Fossil-based & Bio-degradable
Natural fiber reinforced plastics	Composite materials (wood+plastics)	natural macromolecules	microorganism fermentation products	Source: animals	Bio-degradable Polyesters
		Starch	Polylactic acid (PLA)	Chitin	
		Cellulose	Polyhydro-xyalkanoates (PHB, PHV)	Proteines (e.g. casein, gelatin)	
		Lignin			

**BIO-BASED ≠ BIODEGRADABLE**  
**BIODEGRADABLE ≠ BIO-BASED**  
 Not every plastic product is supposed to be biodegradable. Some bio-based plastics are designed to be durable (example: window frame).

**capability:** Technically, the majority of all properties of plastic types can be reproduced from renewable resources [8].  
**primary vs. secondary resources:** Plastics based on primary resources implicate land and sustainability issues (food vs. fuel-conflict). Therefore, bioplastics based on secondary materials such as straw and food waste do not evoke the same dilemma.



Share of bioplastics (global production, 2017)

Source: German Environment Agency (UBA) 2018 based on nova-Institut/EUBP 2017

► Production and use are slowly growing

## Germany:

- General plastics production 2015: 18,5 million t/a (5,75% of the global plastics production, 322 million t/a)
- production of biodegradable plastics 2015: ca. 42.000-55.000 t/a (2015)

# Bioplastics

## (Bio)plastics are highly regulated

### EU REGULATORY FRAMEWORK

Packaging and packaging waste  
Dir. 94/62/EG  
Dir. 2004/12/EG  
Dir. 2018/852

Waste Framework  
Dir. 2008/98/EG  
Reg. (EU) 2017/997

Plastic Bags  
Directive 2015/720

REACH  
EC 1907/2006  
(chemicals)

EN 14995 norm  
(plastics)  
**VOLUNTARY**

EN 13432 norm  
(requirements for recoverable packaging)  
**VOLUNTARY**

### GERMAN REGULATORY FRAMEWORK

Packaging Ordinance

Regulation on bio waste (Bio-AbfV, 1998, 2017)

Implementation of  
Dir. 2015/720

Sewage Sludge  
Ordinance (DüMV, 1992, 2017)

## As bioplastics are highly regulated,

market entry costs are high and, therefore, the **impact on the global plastics market is still limited and as a consequence its production is growing slower than expected**. In 2016, bioplastics counted less than 1.3% of the total amount of plastics globally produced [3].

## European policy strategies seek to foster bio-based products

- goal of the Bioeconomy Strategy: “the partial replacement of non-renewable products by more sustainable bio-based ones” [9]
- priority area of the Circular Economy Package: plastics and bio-based products

Bioeconomy  
Strategy  
**2012, 2018**

Circular Economy  
Package & Action  
Plan **2015, 2018**

**By 2030:** all plastic packaging in the EU should be recyclable

Strategy for  
Plastics in a  
Circular Economy  
**2018**

# Which are regulatory obstacles of the Waste Framework that hinder the transformation towards the Bioeconomy? Which are possible solutions?

## National initiatives

(Italy 2011)

legislative ad hoc measure:

**ban of traditional plastic bags + EN 13432 criteria mandatory**

→ Shopping bags have to be either biodegradable and compostable or reusable

(Decreto Legge 25 gennaio 2012, n. 2)

▶ **positive effect:** new chemical sites, less plastic bags used [13, 16]

▼ Possible solutions

### 1. There has been a conflict with Art. 18 of the Packaging Directive (“freedom to place on the market”)

→ Consequence: infringement procedure against Italy in 2013

→ Amendment of the Directive in 2015: from now on Art. 4 1a supports similar measures

▶ Prioritization of waste reduction over freedom to place on the market

### 2. Studies showed that half of all bags are conventional and not conform with the law [14,16]

→ fraudulent behaviour by the economic operators

▶ Better and more intensified controls of the producers and traders

### 3. Bioplastics are modern waste: It's difficult for clients and the treatment sector to differentiate between bioplastics and conventional plastics [1,2]

▶ misconceptions

▶ inefficient treatment

▶ Information campaigns  
▶ Modernization of the Waste Treatment

▼ Obstacles

▼ Obstacle

### Substitutions means continuity of the “throw-away-mentality”

Bioplastics do not resolve plastic pollution given that their essence aims substitution, not the change of **consumption patterns** [15].

▶ Mixed strategy: bioplastics + **reusable alternatives**, e.g. nylon bags; waste prevention strategies



# Bioplastics

## Conclusion & Forecast:

The EU acknowledges the important role that bioplastics will play in achieving the Plastic Strategy. The introduction of **regulatory market push & pull measures** (e.g. requirements for a minimum bio-based and recycled content in plastic product designs) may promote the diffusion of bioplastics, but must come along with **waste prevention strategies** as renewable resources are not unlimited and trade-offs between food and fuel persist.

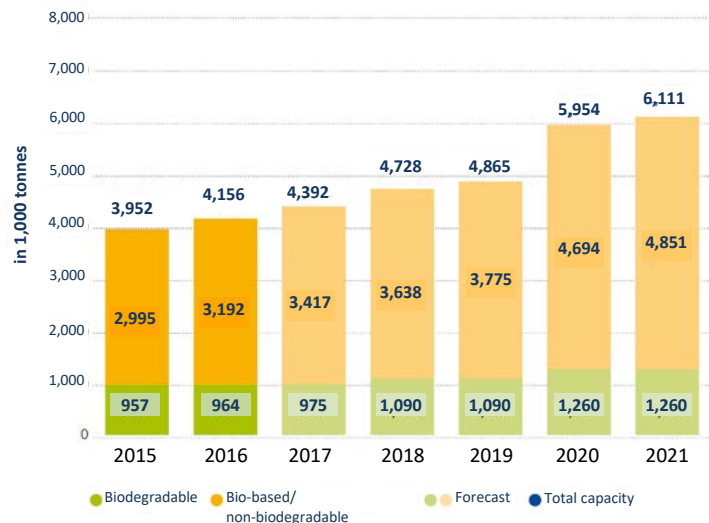
Recent amendments of the Waste Directive and the Directive on Packaging and Packaging Waste may promote bioplastics position on the market and inside the Circular Economy.

The Italian case shows that legislation on bioplastics can only be effective when accompanied simultaneously by **clear standards and certification schemes**. **Information campaigns** may help to ensure that consumers **recognize plastics** properly when they buy and discard them.

Still, the **waste management of bioplastics** is not efficient. As soon as bioplastics become more diffused and their market share grows, it is very likely that waste management will adapt technologically and that bioplastics will be recognized easier (e.g. through sensor-based material identification) [12]. Each type of bioplastic has to be examined on a case-by-case basis **considering their individual life cycles**.

## Forecast

### *Global production capacities of bioplastics*



Source: European Bioplastics, nova-Institute (2017)

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