



Ending Plastic  
Waste



# CSIRO-Murdoch-Industry Bioplastics Innovation Hub

Overview by Professor Daniel Murphy

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**CSIRO: \$50m to turn  
science into waste  
solutions**

By Colleen Bate | 23 March 2022





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Established March 2022.

The hub's research and development underpins CSIRO's Mission for Ending Plastic Waste and reflects significant collaborative work between researchers and industry.

We aim to aid industry in establishing an advanced biomanufacturing sector, to commercialise 100% compostable bioplastics.



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## CSIRO-Murdoch-Industry Bioplastics Innovation Hub Meet some of the Team

### CSIRO BioFoundry

The BioFoundry is a state-of-the-art facility providing a platform to accelerate discovery and bioengineering for the emerging bioeconomy.

- Design DNA for construction.
- Microorganism bioengineering.
- High-throughput strain screening
- Development of protocols to use new organisms.

### Murdoch University

Murdoch is a research-led university with a strong focus on multidisciplinary translational research.

- Microbiology laboratories
- Molecular laboratories
- Radioisotope laboratories
- Insect laboratories
- Pilot plant – Ecopha Pty. Ltd.



Ecopha is focused on developing biodegradable plastics.



Spiegare support new and innovative technology being commercialised.



BioRA Biorenewable alternatives provide expertise in polymer science.

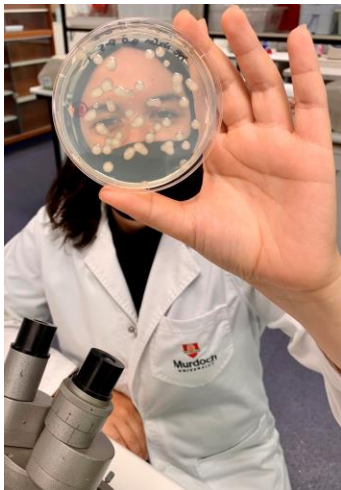


Industry partner Ecopha installing their Pilot Plant at the Bioplastics Innovation Hub, Murdoch Uni.

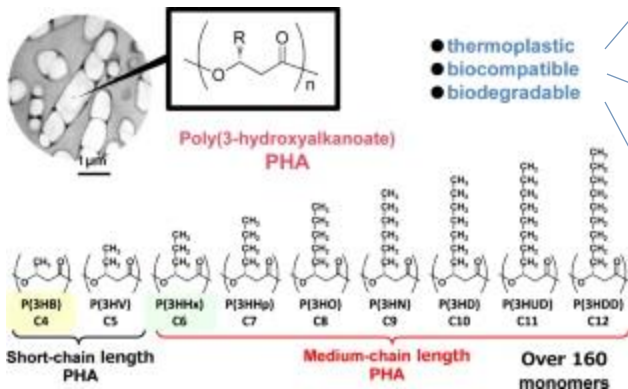


The **Bioplastics Innovation Hub** unites scientific and industry expertise.

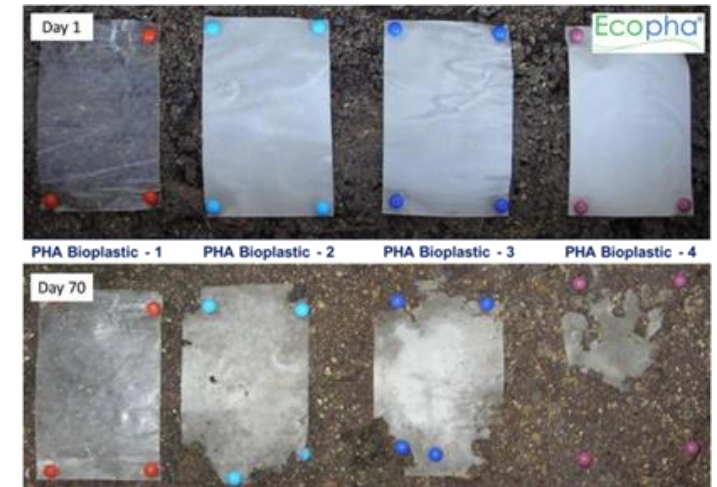
- **Polyhydroxyalkanoates (PHA)** - these second-generation polymers are microbially-made: 100% biodegradable, thermoplastic, insoluble in water, non-toxic and biocompatible.
- Over 150 different **PHA** polymer structures are currently known, which is advantageous for commercial production.
- The advantage for the plastics industry and for waste management is that products are 100% biodegradable (compostable bioplastics) leaving no lasting plastic legacy on land or in water.



### Polyhydroxyalkanoates (PHA)



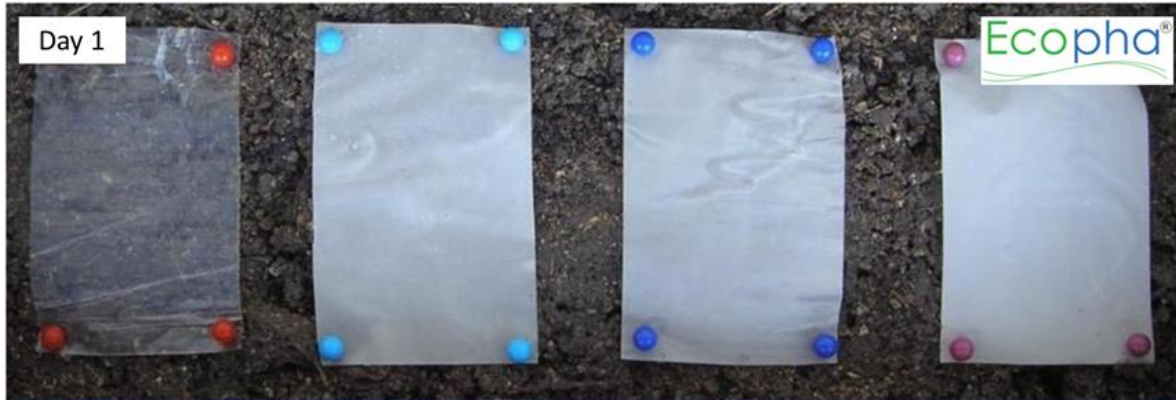
- Become plastic on heating and harden on cooling.
- Not harmful or toxic to living tissue – medical use.
- Capable of being decomposed by living organisms and thereby avoiding pollution.



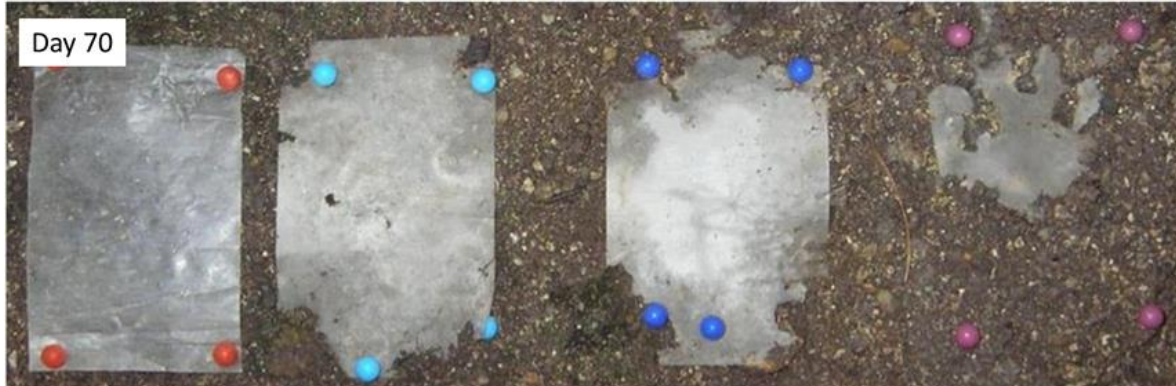


The **Bioplastics Innovation Hub** unites scientific and industry expertise.

- **PHA** 100% compostable bioplastics break down naturally, even in the ocean, at natural temperatures
- **PHAs** naturally break down to carbon dioxide and water avoiding the accumulation of micro-plastics



PHA Bioplastic - 1    PHA Bioplastic - 2    PHA Bioplastic - 3    PHA Bioplastic - 4



Day 70

### PHA break down

Australian certification AS 5810 requires compostable products to disintegrate after 180 days and completely biodegrade after 12 months in a home compost.



Not to be confused with **Poly-lactic acid (PLA)** which is the largest volume of bioplastic.

**PLAs** do break down but only in an industrial composting facility.

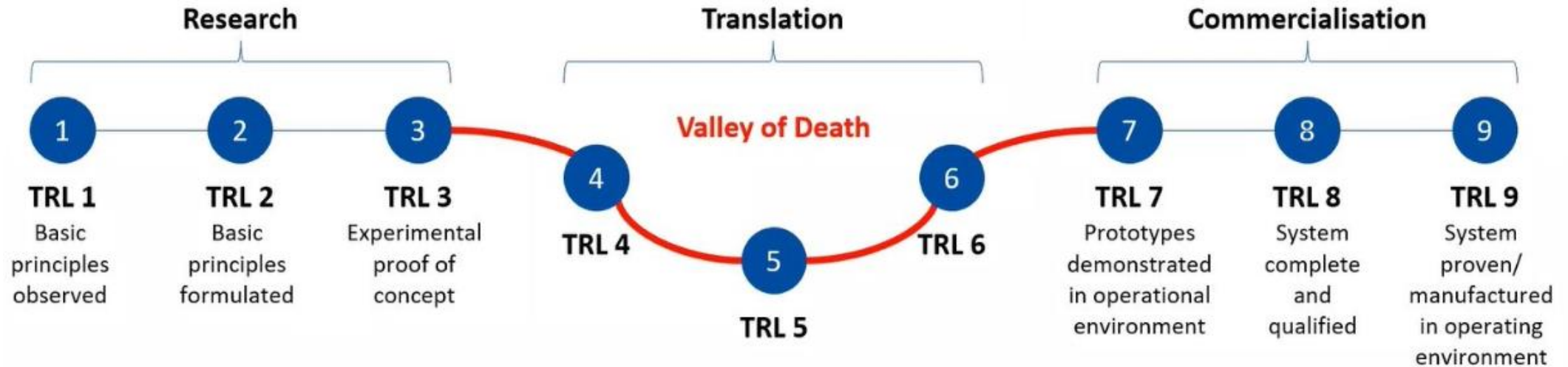
Industrial composting only occurs under a specific set of circumstances.

**PLAs** require temperatures above 60 Celsius to begin composting.



## Bioplastics Innovation Hub avoiding the ‘Valley of Death’

- The ‘Valley of Death’ (TRL 4 to 6) refers to the large gap between basic scientific research and translation to new technologies, treatments and practices.
- Cost and risk, in particular, makes it hard to transition a new technology or approach to real life.

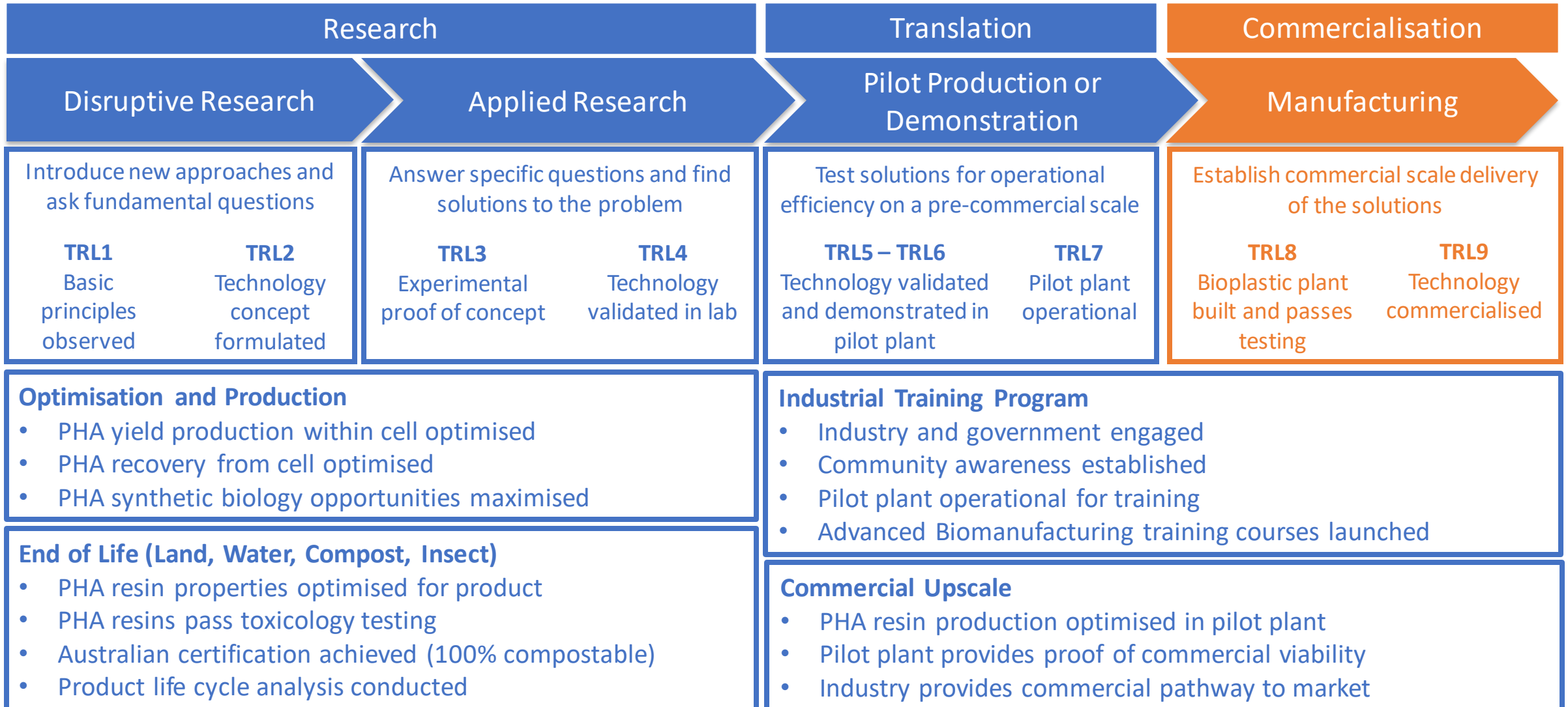


\*Technology Readiness Level (TRL)

Many research ideas do not lead to commercialisation.

**Effective translation** between research and industry is essential to success.

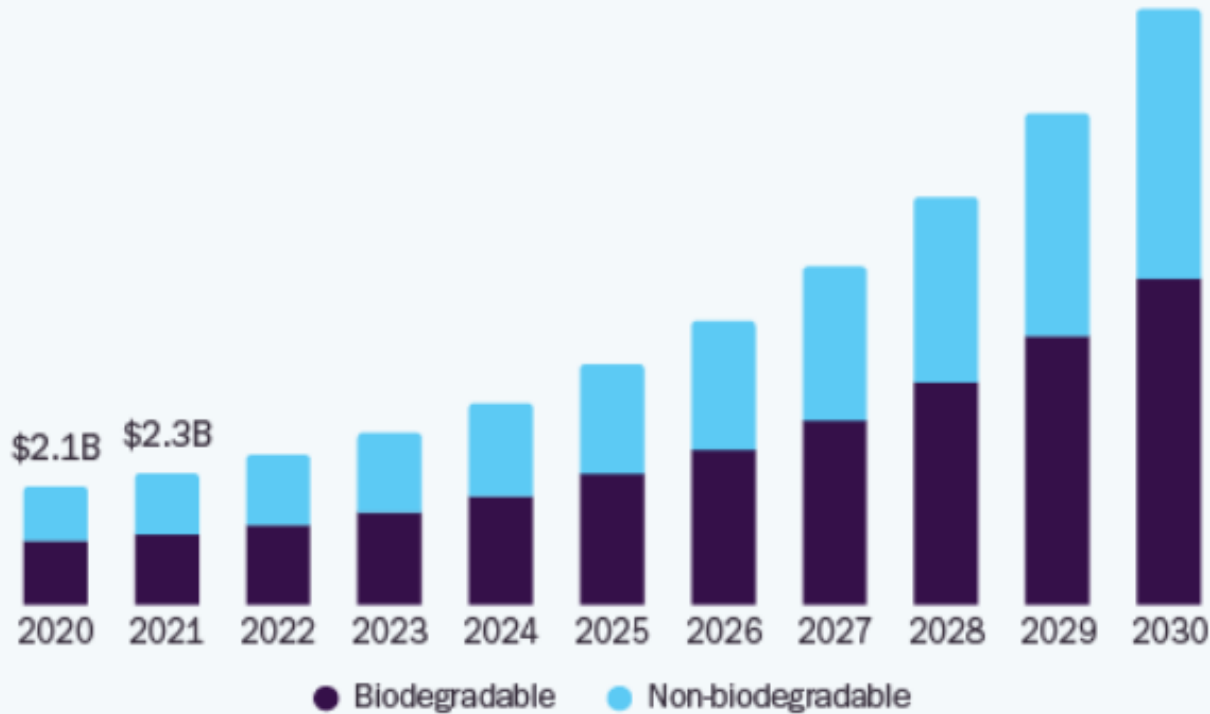
**Compostable Bioplastics: An innovation that alters the way that consumers, industries and businesses operate**





### U.S. Bioplastics Market

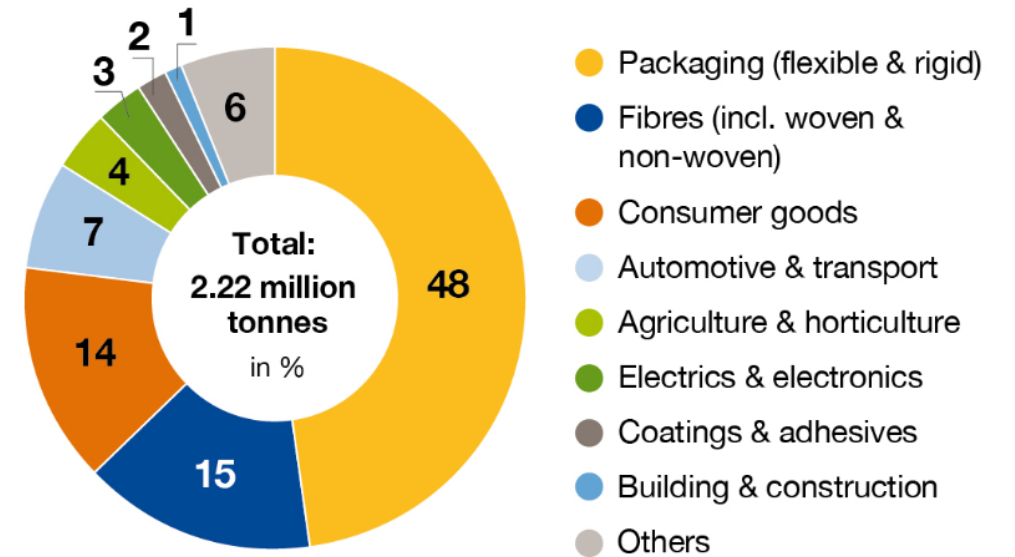
Size, by Product, 2020 - 2030 (USD Billion)



The global bioplastics market size was estimated at USD 11,610.5 million in 2022 and is expected to expand at a compound annual growth rate of 18.8% from 2023 to 2030.

<https://www.grandviewresearch.com/industry-analysis/bioplastics-industry>

### Global production capacities of bioplastics in 2022 (by market segment)



Source: European Bioplastics, nova-Institute (2022).

More information: [www.european-bioplastics.org/market](http://www.european-bioplastics.org/market) and [www.bio-based.eu/markets](http://www.bio-based.eu/markets)





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# Thank you

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<https://www.murdoch.edu.au/explore/about-murdoch/our-locations/rockingham-campus>

<https://www.csiro.au/en/work-with-us/use-our-labs-facilities/biofoundry>



Australia's National  
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Revolutionising  
plastic design,  
materials and  
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