

# Composites and End-of-life options

Trends and opportunities to improve the life cycle performance of composites materials

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Embracing ambition

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## JEC 2021

## Agoria Solar Team

MEET THE AGORIA SOLAR TEAM @ JEC 2020,  
WINNERS OF THE BRIDGESTONE WORLD SOLAR CHALLENGE 2019!

Upcoming events:

AGORIA: 1st of October 2020:  
Manufacturing Business Day,  
Bluepoint Brussels

CFK Valley Belgium / Centexbel 7-8th of October 2020:  
Composites Innovation Day 'Circularity'  
+ 'Braiding with Thermoplastic Composites'  
Bluepoint Liège, Belgium

interreg  
North-West Europe  
Cobracomp

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CFK VALLEY BELGIUM

THE BLUEPOINT WILL BE EXPLORING A NEW  
**TERRITORY**

A photograph of the Agoria solar car, a blue and white vehicle with solar panels on its roof, parked on a paved road in a desert landscape. The car is covered in various sponsor logos, including Agoria, Bridgestone, and others. The background shows a vast, arid landscape with sparse vegetation and a zebra grazing in the distance under a clear blue sky.

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# The Belgian Composites Industry

# ***The Belgian Composites Industry in 3 key-figures***

**200**      **Companies** (150 Converters and 50 raw materials suppliers)

**6.000**      **people** employed in Belgium

**1.6B€**      **sector revenues** in Belgium

## Federal



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## Wallonia



PLASTICS INNOVATORS

## Flanders



# Priorities Agoria BG Composites

Topics	40 members
Education	Study on competences completed in 2019, multi-stakeholder platform set up to address specific challenges
Corona / Covid19	Gathering information and taking action to better outreach to the industry (e.g. initiative 22.10.2020, Webinar with intro Airbus on project opportunities, 29.10.2020 webinar with pitches of Belgian companies)
Other topics	<a href="#">Circularity of composites materials (in collaboration with EuCIA)</a> , Export restrictions, REACH and CLP, Styrene emissions,

# Key Actions

- **Events**

- Webinar 22 October 2020 – 09.30h–12.00h on ‘Access to EU-funding’
- Webinar 29 October 2020 – 09.30h–12.00h – Possibility for a pitch
- Business Group Meeting, 17 November 2020

- **Skills & Competences**

- Input and collaboration

# Circular Economy: CompositesLoop

**CompositeLoop – Exploring End-Of-Life Solutions for larger composites structures (Sirris / Agoria / Go4Circle), interclusterproject with IBN Offshore**

**62.617 EUR of funding, of which 10.287 EUR funding for Agoria, funding rate of 80% (20% cofinancing), conditionally accepted by VLAIO**





# Activities of EuCIA

Important to know the actions in this domain

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## Prospect for New Guidance in the Design of FRP Structures

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# ECOCALCULATOR



<http://ecocalculator.eucia.eu/>

# Trends in composites waste management

- Dominant technologies
- Looking at the circular value chain

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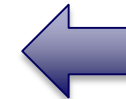


Cross-sector industry platform outlines best strategies for the recycling of wind turbine blades



Photograph by Damon Hong

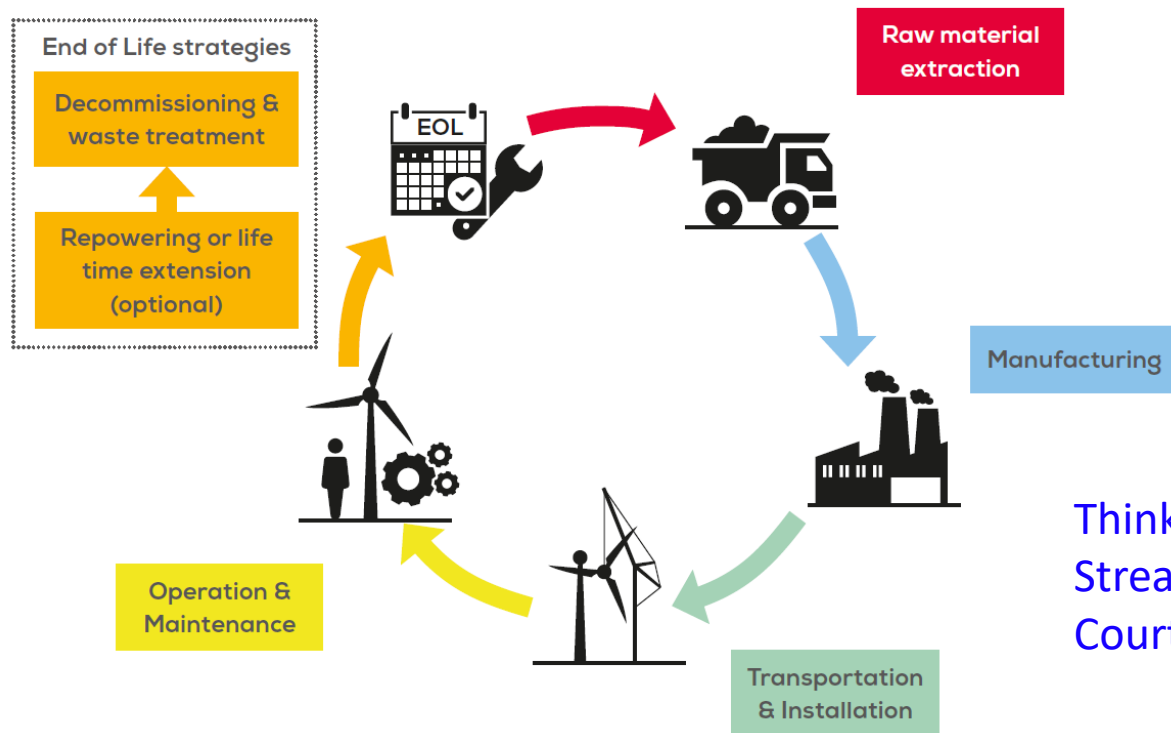
Brussels, 26 May 2020 – WindEurope, the European Chemical Industry Council (Cefic) and the European Composites Industry Association (EuCIA) present their recommendations for the recycling of wind turbine blades in their new report 'Accelerating Wind Turbine Blade Circularity'.



Following slides refer to the study that can be found back online

<https://eucia.eu/news/cross-sector-industry-platform-outlines-best-strategies-for-the-recycling-of-wind-turbine-blades/>

# Composites in a circular value chain



Thinking in terms of waste  
Stream management  
Courtesy: Wind Europe, EUCIA

# *Active areas in material research for wind turbine blades*

	AREAS OF MATERIAL RESEARCH	EFFECT
Processing Design	Process modelling aimed to optimise and accurately control the curing processes of the composites	Increased lifetime, higher conversion efficiency
Process	Incorporating automatised manufacturing processes to ensure consistent material qualities and more robust manufacturing techniques	Increased lifetime, higher conversion efficiency
	Promoting cost- and energy-efficient manufacturing processes for carbon fibre reinforced composites, since the material provides enhanced mechanical properties. As a side benefit it is also financially more attractive to recover carbon fibre compared to glass fibre.	Enable manufacturing of longer blades, hence increasing conversion efficiency

Processing and design

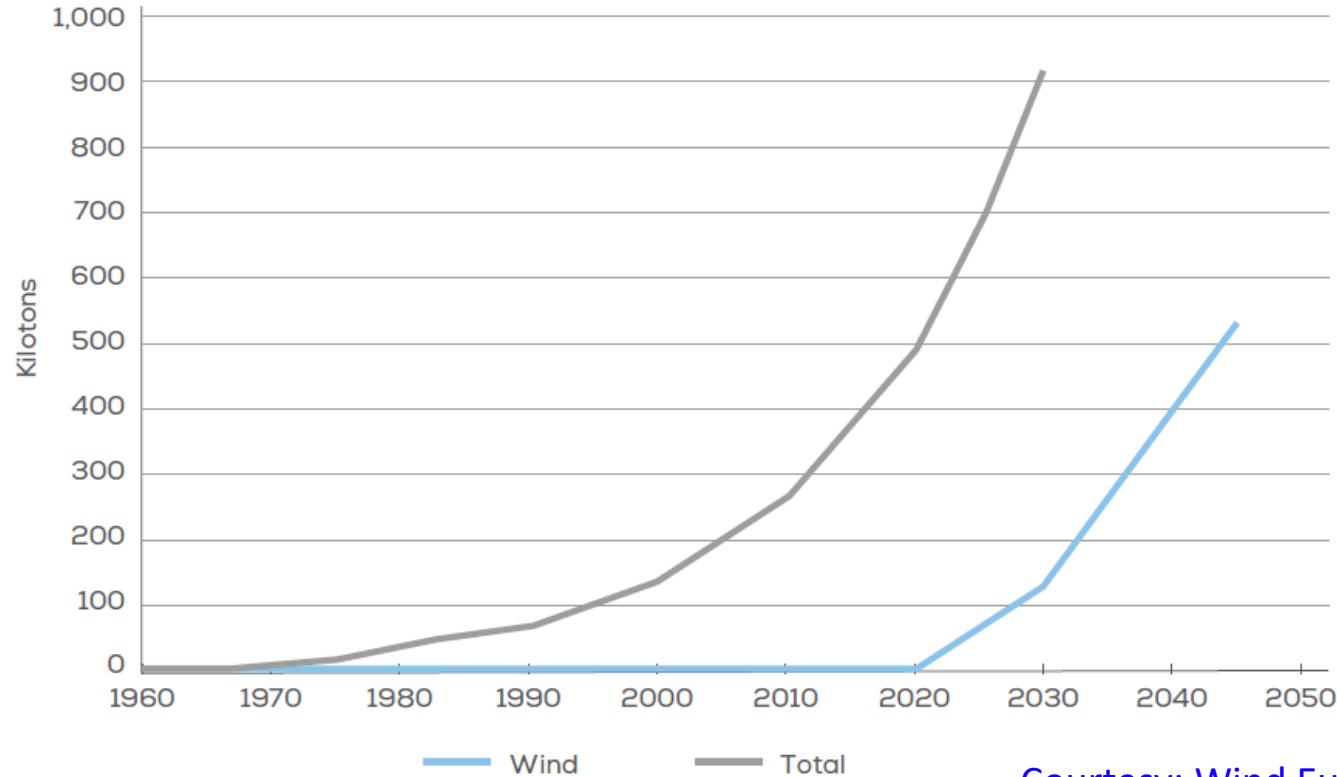
Courtesy: Wind Europe, EUCIA

	AREAS OF MATERIAL RESEARCH	EFFECT
Materials	Introducing innovative resin/fibre combinations with improved ductility and fatigue resistance	Increased lifetime
	New infusible thermoplastic resins which are processed by in-mould polymerisation (rather than melt processing) and have better mechanical properties	Cost reduction
	Introducing nano-components as strengthening agents in matrix and coatings, whilst respecting HSE requirements and ensuring it does not lead to more complex recycling methods	Increased lifetime
	Investigating fibre architectures – combining high performance glass fibres, carbon fibres and nano-engineered fibres to make hybrid reinforcements	Enable manufacturing of longer blades, hence increasing conversion efficiency
	Investigating durable coating materials to ensure improved erosion-resistance e.g. gel-coats, paint systems and tapes, resealable and self-healing coatings	Increased lifetime, higher conversion efficiency
	Development of bio-resins for improved performance, taking advantage of higher availability of bio-waste	Continued availability of raw materials and security of supply after depletion of fossil-based raw materials; Reduced carbon footprint
	Developing 3R-resins – a new family of enhanced thermoset resins and composites with better re-processability, repairability and recyclability properties	Increased lifetime; Improved recyclability

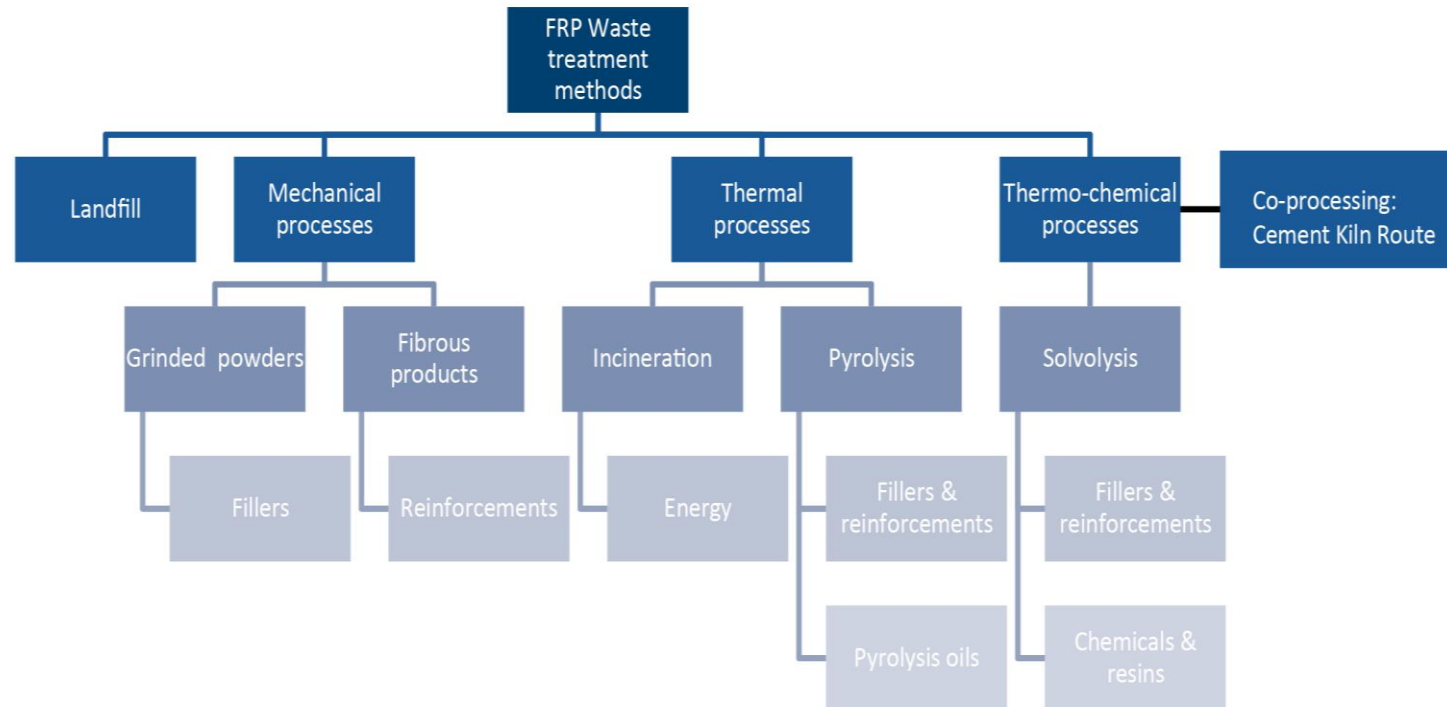


FIGURE 5

Composite waste generation – sector trends (ktons/year)



Courtesy: Wind Europe, EUCIA, CEFIC



Adapted from Wind Europe, Sacchi (2014) , Skrivars 2015 and EuCIA (2011)





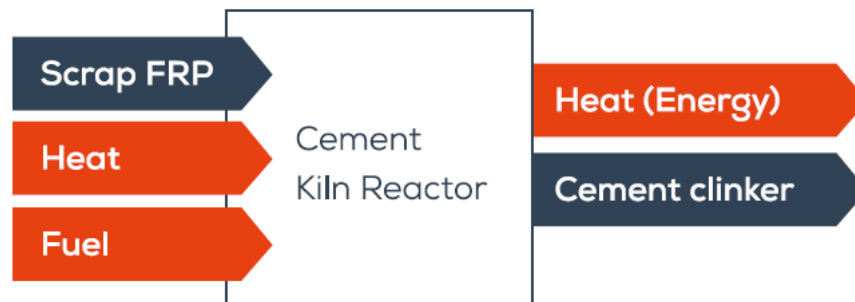
Cowl tool support (automotive), Maier



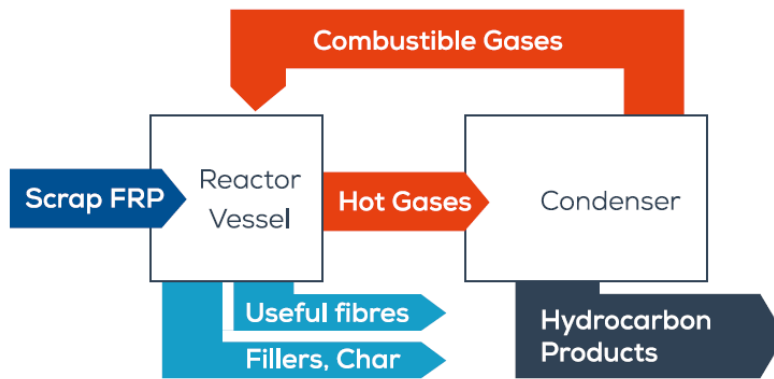
Modern urban furniture, DesignAustria



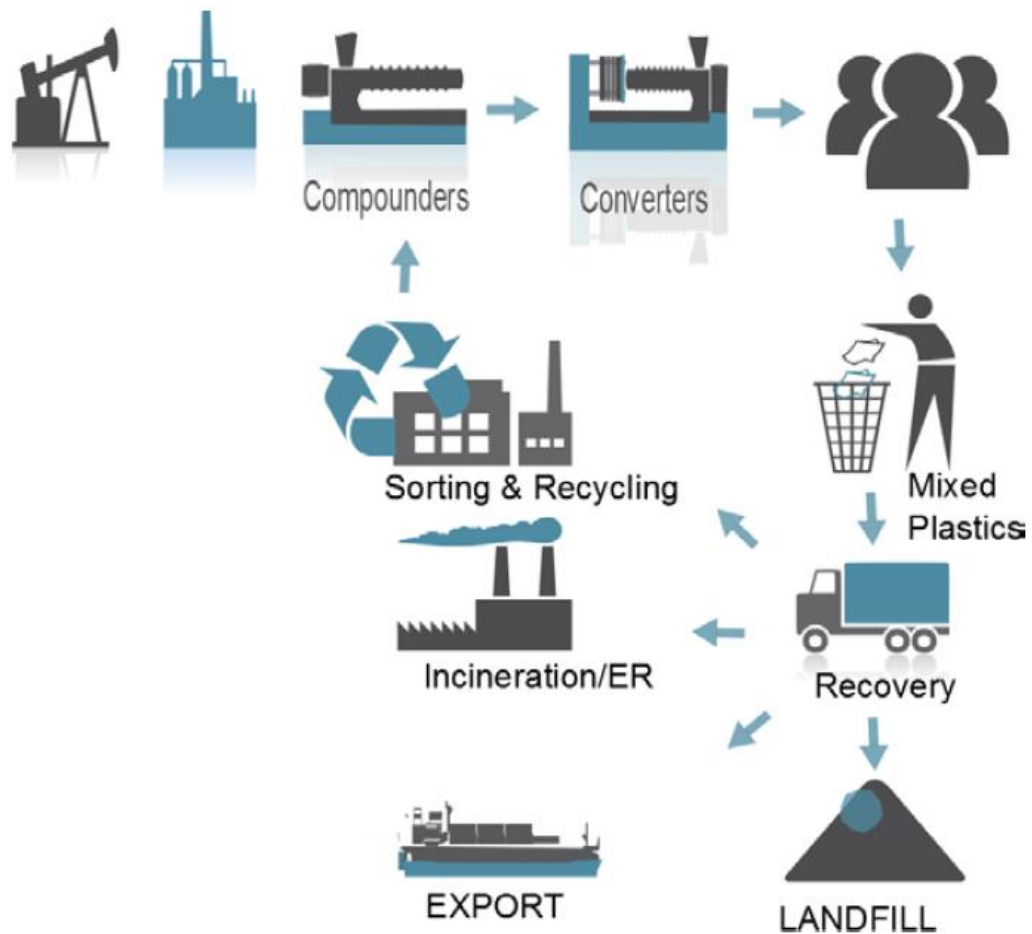
Bathroom furniture, Novellini



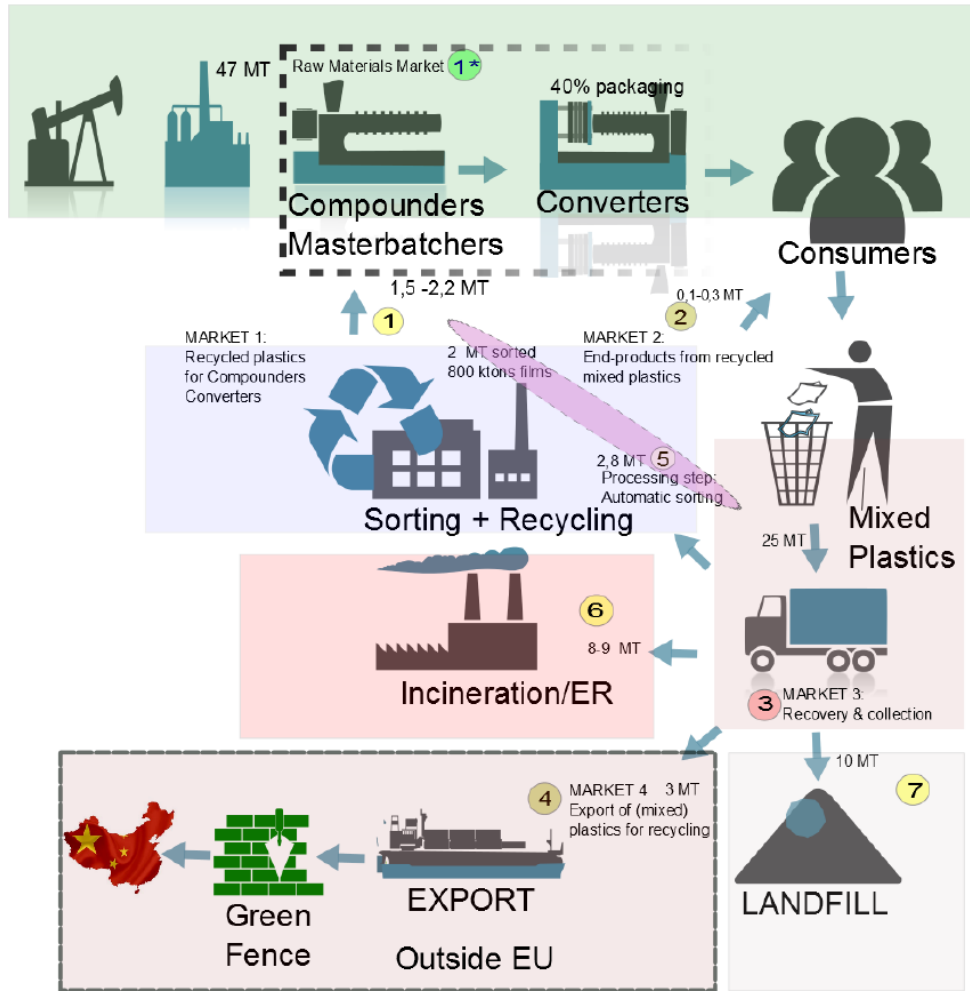
TRL	STRENGTHS	DISADVANTAGES	POINTS OF ATTENTION
9	<ul style="list-style-type: none"> <li>Highly efficient, fast and scalable</li> <li>Large quantities can be processed</li> <li>Capability to reduce CO<sub>2</sub> emissions of cement manufacturing by up to 16%</li> <li>Slightly increasing energy efficiency of cement manufacturing</li> <li>No ash left over</li> </ul>	<ul style="list-style-type: none"> <li>Loss of original fibre's physical shape</li> </ul>	<ul style="list-style-type: none"> <li>Pollutants and particulate matter emissions (although appropriate mitigation exists in compliance with the Industrial Emissions Directive)</li> <li>So far only suitable for glass-reinforced composites</li> </ul>



TRL	STRENGTHS	DISADVANTAGES	POINTS OF ATTENTION
Pyrolysis: 9 Microwave: 4/5	<ul style="list-style-type: none"> <li>The bi-products (Syngas and oil) can be used as energy source or as base chemicals/building blocks</li> <li>Easily scaled-up</li> <li>Microwave pyrolysis: Easier to control. Lower damage to the fibre</li> <li>Already used at commercial scale for recycling carbon fibre composites</li> </ul>	<ul style="list-style-type: none"> <li>Fibre product may retain oxidation residue or char</li> <li>Loss of strength of fibre due to high temperature</li> <li>Decreased quality of the recovered carbon fibres from original material (lowest value loss in comparison to other mature recycling technologies)</li> </ul>	<ul style="list-style-type: none"> <li>Economically sound for carbon fibre recovery to date</li> </ul>



REMIX report  
2012 / EuPC, PEP, PRE



Figures for conventional  
plastics  
(not only composites)

Source: REMIX,  
Plastics The Facts 2018



# Boundary conditions for Recycling of Composites



- Logistics
- Price tag
- Eco-costs

After: Ben Drogts, BiinC

Technology  
cost  
Eco-costs

Application development  
income  
Eco-revenue

What about  
voluntary  
initiatives?



ABOUT US

OUR  
ACHIEVEMENTS

SUSTAINABILITY

THE CIRCULAR  
ECONOMY

RESOURCES

REGISTER NOW

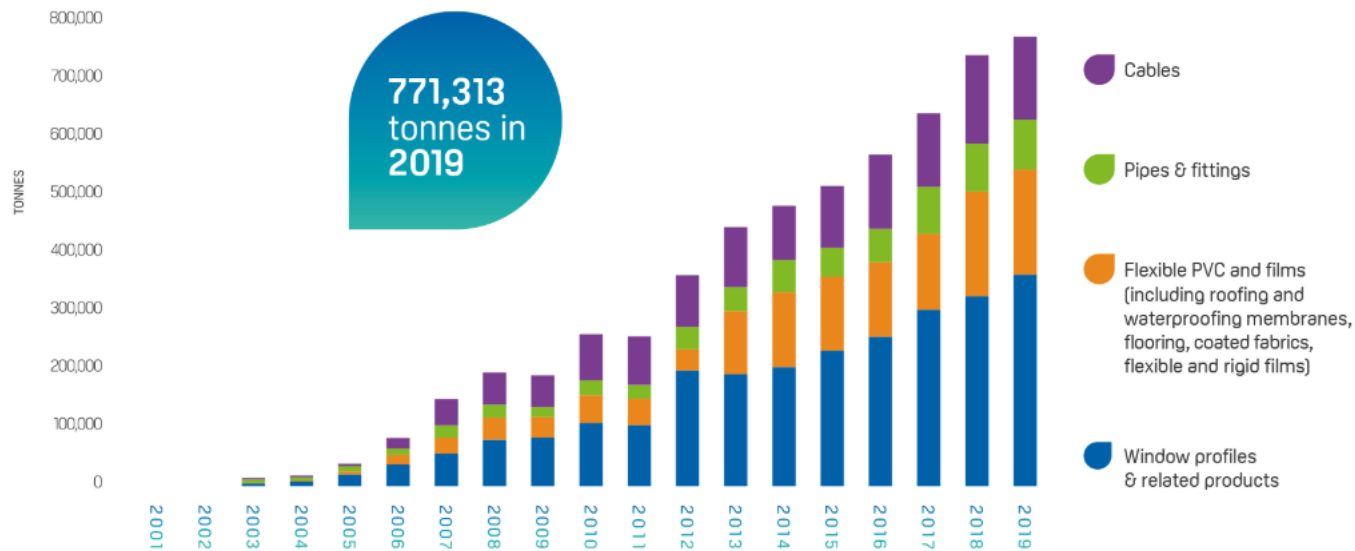
**The VinylPlus  
Sustainability Forum  
GOES VIRTUAL**

**#CIRCULARVINYL**

**Additive  
Sustainability  
Footprint**

PVC waste recycling within the VinylPlus framework reached 771,313 tonnes in 2019, a 4.3% increase compared to the previous year.

## PVC RECYCLED WITHIN THE VINYLPLUS FRAMEWORK



# Conclusion - Useful initiatives for the future

- **Setting up larger scale voluntary initiatives with all stakeholders**
  - Waste stream management
  - Voluntary commitment
  - Life cycle assessment
  - Debate on EPD's
- **Skills & Competences**
  - Input and collaboration

# Upcoming

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- **Skills & Competences**

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# Thank you

For your attention



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