

Lorenzo Garzia, Polynt S.p.a.

EU Technical Service Manager UPR/GC

Joined the Company in late 2017 just after the University Career spent at the University of Bologna – ALMA Mater Studiorum. Graduated both at Bachelor and Master Degree in Industrial Chemistry and then completed a PhD in Chemistry in the field of “Development of Industrial Heterogeneous Catalysis and Industrial Processes”.

My career in the company started in R&D division growing up until the actual position.

Core knowledge and competence

- Industrial Chemistry
- Management and Development of Industrial Production Processes
- R&D
- Heterogeneous Catalysis
- Polymeric Material (thermoset as well as thermoplastic)
- Business Management



Polynt Group Sustainability Strategy:

**A New Approach Towards Composite Materials
featured by Reduced CO₂ Emission**

Lorenzo Grazia

EU Technical Service Manager UPR/GC

*Finland Composite Seminar
November 6th - 7th, 2024
Pietarsaari (FIN)*

Item List

- Sustainability Strategy and Targets
- Polynt – Integrated Business Model
 - GHG Reduction Strategies
- Life Cycle Assessment (LCA)
- Case Study
 - GHG reduced UPR-based product – State of the art in Polynt
- Thermoset Composite Material end-of-life Recycle



Polynt Group

we are a specialty
polymers & intermediates
company
and innovation is our mission

A dark blue background featuring a glowing globe on the left side. The globe is overlaid with a complex network of white lines and dots, resembling a molecular structure or a global network. The lines connect various points across the globe, creating a web-like pattern.

37 plants in the world

2,390 mrd € turnover in 2023

3.036 employees

786 kton volume sale in 2023

Polynt Group – Sustainability Strategy

- Polynt Group presented its first **Sustainability Report** for the year **2022**.
- This report has been prepared “with reference to” the **Global Reporting Initiative (GRI) Standard**, the international reference standards for non-financial reporting.
- A detailed materiality analysis identified the **priority topics** to report on:



- **2023 Sustainability Report has been released in May 2024.**
- Polynt will report on a full range of sustainability data and information relevant to the Group’s business starting from the fiscal year 2025 in accordance with the new EU Corporate Sustainability Reporting Directive (CSRD).

Polynt Group – Sustainability Targets

- GHG 20% reduction by 2030
- 0 injuries on a worldwide basis by 2030
- Full ESG evaluation of our supply chain on a worldwide basis by 2028
- 20% increase of female presence in the managerial roles by 2030
- Reaching 100% of IT users yearly security training by 2025
- 20% decrease of salary gap by 2027



Item List

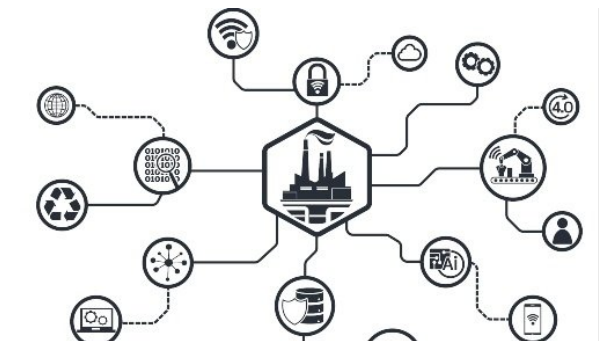
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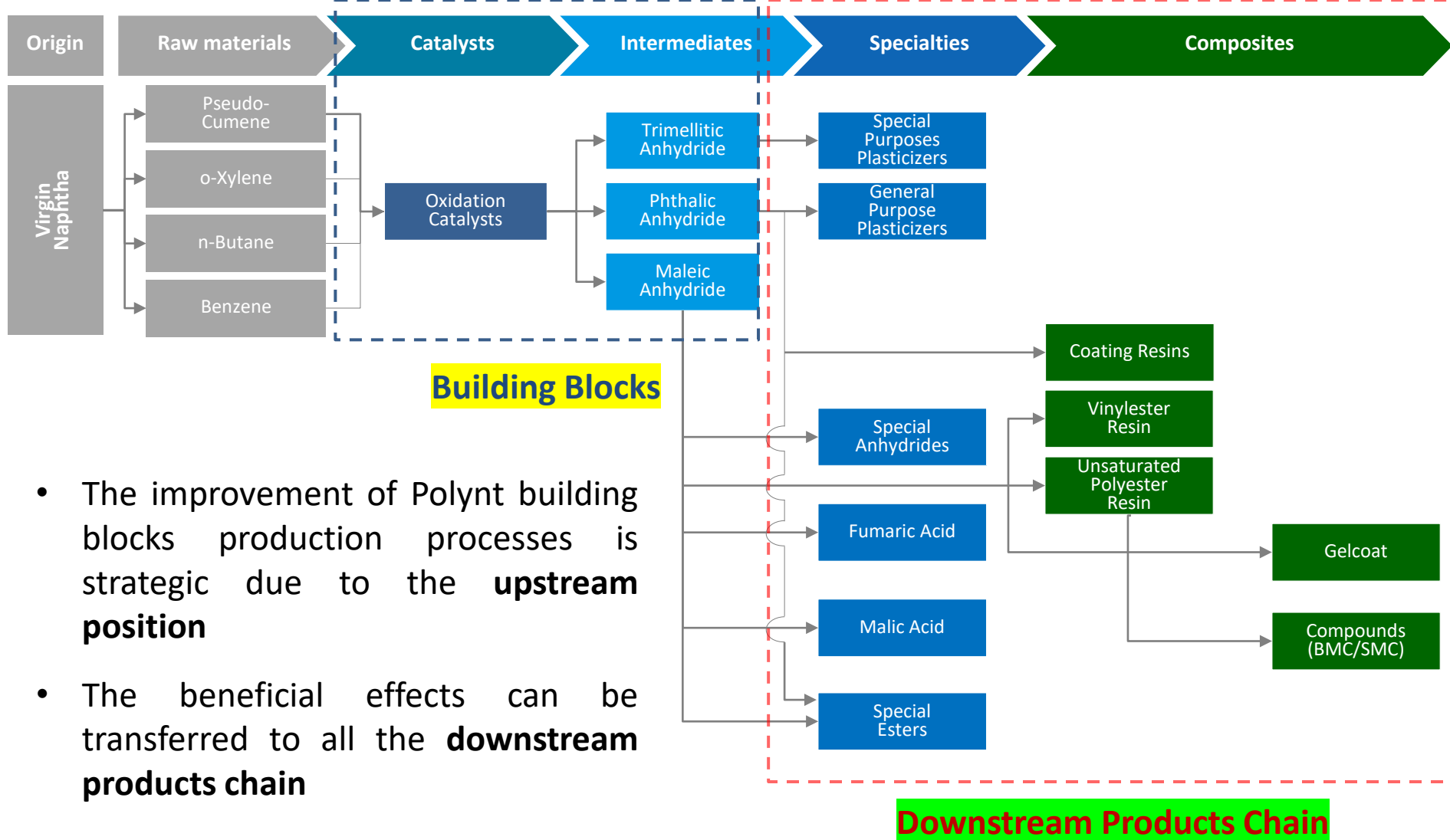
Polynt Group – Environmental Targets

How to exploit the target of GHG 20% reduction

- **New/Improved Industrial Production Processes** (efficiency enhancement inside Polynt Integrated Business Model borders)
- **Renewable Input** for Building Blocks
- Development of **Renewable-based Products** to progressively substitute fossil ones
- Creation of **Recyclable Products** to reduce end-of-life impact
- **Machine Learning** and **AI (Artificial Intelligence)** to predict new products formulation with minimized GHG emission



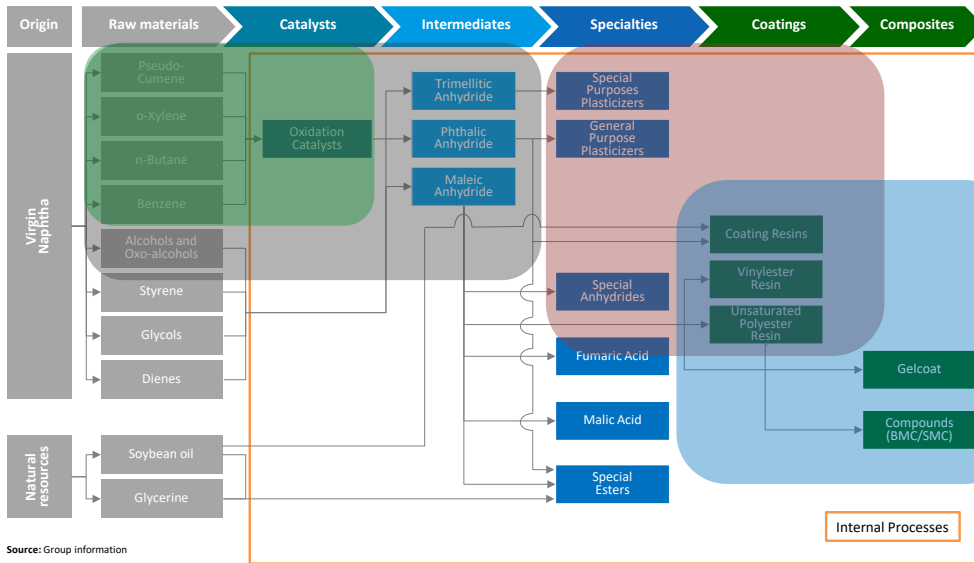
Polynt – Integrated Business Model



- The improvement of Polynt building blocks production processes is strategic due to the **upstream position**
- The beneficial effects can be transferred to all the **downstream products chain**

Downstream Products Chain

Polynt – Integrated Business Model



Source: Group information



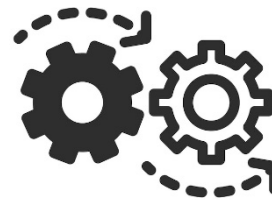
New Products

- Bio-based (integrated) resins
- Renewable monomers
- Mass-balance approach



Renewable Input for our Building Blocks

Positive outcome (reduced CO₂ emissions) transferred to the whole downstream Products Chain



New Processes

- Improved Reactor efficiency
 - Lower CO₂ emissions
- New technologies for Building Blocks



Recycling

- Recyclable products development
 - Recycled raw materials

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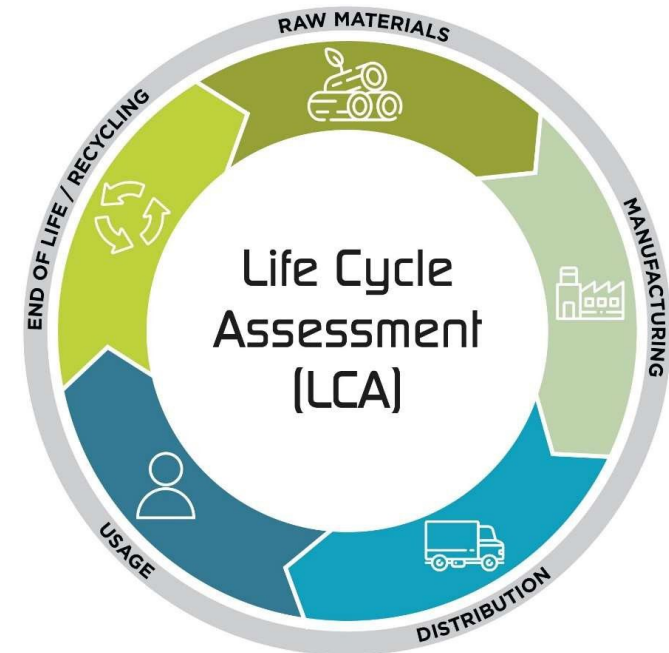
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Polynt Group – Life Cycle Assessment

Life Cycle Assessment (LCA):

- Methodology used to measure the **environmental impact** of a product (or a system) throughout its **life cycle**
- It measures the environmental impacts from **extraction** of raw materials, through **processing, manufacture, refurbishment** to eventual **end of life** and **disposal**
- Identify opportunities to improve the environmental performances of products in their life cycle



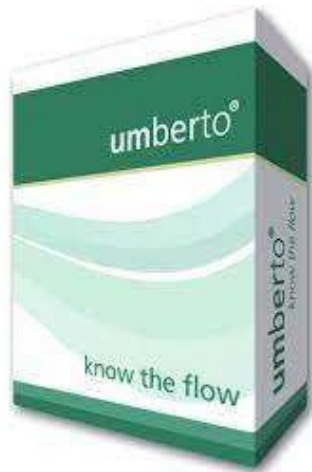
Polynt Group – EU Green Technical Department

- Dedicated and well-equipped group of specialized people working on LCA
- Compliant to **ISO 14040** (*LCA – Principles and Frameworks*) and **ISO 14044** (*LCA – Requirements and Guidelines*)

Polynt Group – Life Cycle Assessment

Modelling

- To calculate the LCA it's necessary to use a special **software** with a **database**
- Several professional software available in the market such as **Umberto**, **SimaPro**, **GaBi**, **openLCA** and database such as **Ecoinvent**
- ***POLYNT adopted Umberto and SimaPro with database Ecoinvent (openLCA available as well)***



SimaPro

openLca

ecoinvent

Polynt Group – Life Cycle Assessment

Databases

- Several databases available which may provide different results
- LCA declarations must specify type and version of software and database used for the calculation of the environmental indicators to avoid inconsistent comparison



Polynt Group – Life Cycle Assessment

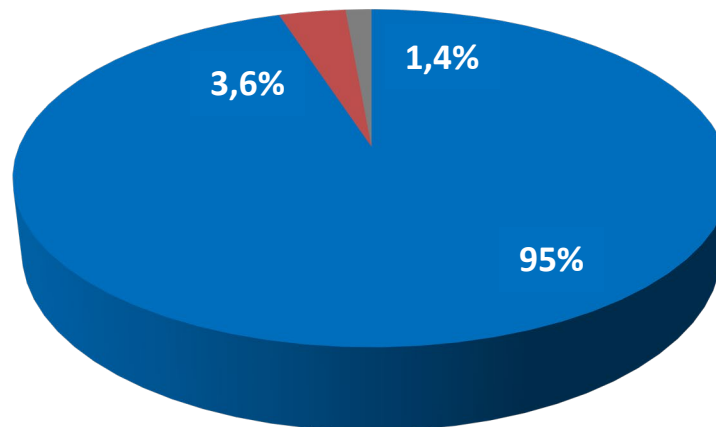
Results and Interpretation

- Raw materials have the greatest impact
- To reduce the environmental impact of UPR, formulation must be changed

Polynt - General Purpose Resin

Climate Change - Total

Contribution by Life Cycle Phase



■ Raw Materials ■ Manufacture ■ Transport

Data calculated with Umberto 11 using Ecoinvent 3.10 database and EF3.1 method

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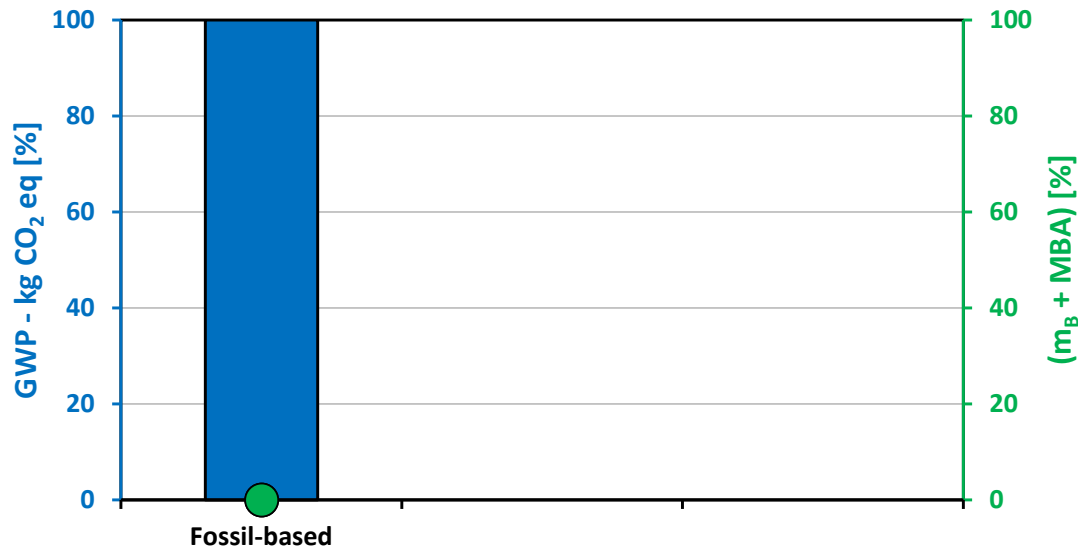
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Polynt Group – Case Study

Development of a GHG reduced UPR-based product

- A standard fossil-based UPR has been taken as an example
- 100% GWP – kg CO₂ eq Index is related to a bio-based content equal to 0%

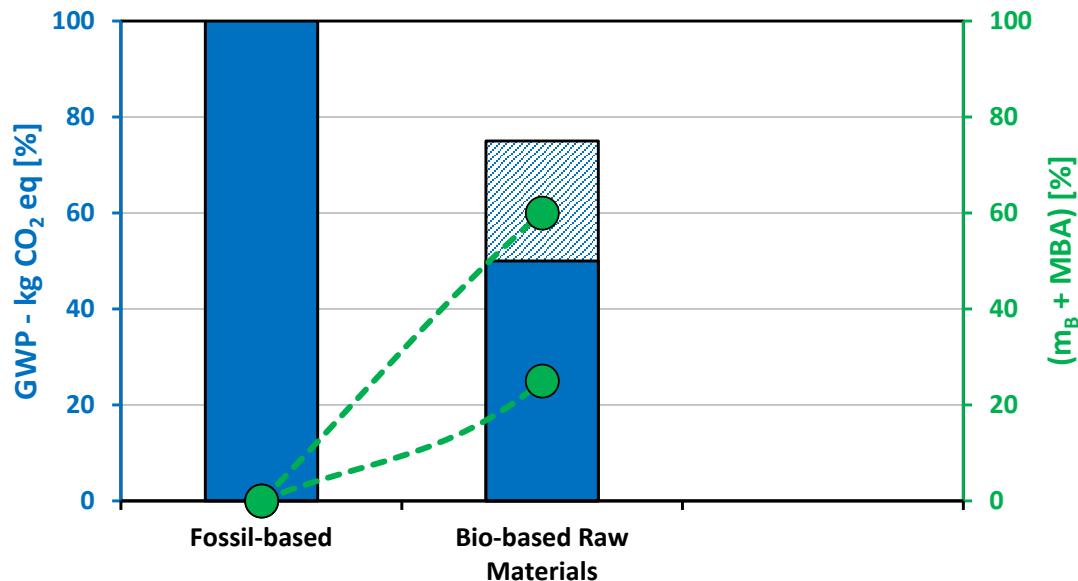


- The **GWP** value was calculated using the partial (cradle to gate) CFP ISO 14067 (IPCC 2021 AR6) environmental impact method, which includes biogenic carbon removals
- **m_B** is the bio-based content of the product, expressed as a percentage of the total mass of the dry matter of the product

Polynt Group – Case Study

Development of a GHG reduced UPR-based product

- The **Bio-Based Raw Material** approach allow to introduce up to **60 wt% of renewable content** in the final product resulting into **50% GWP reduction**

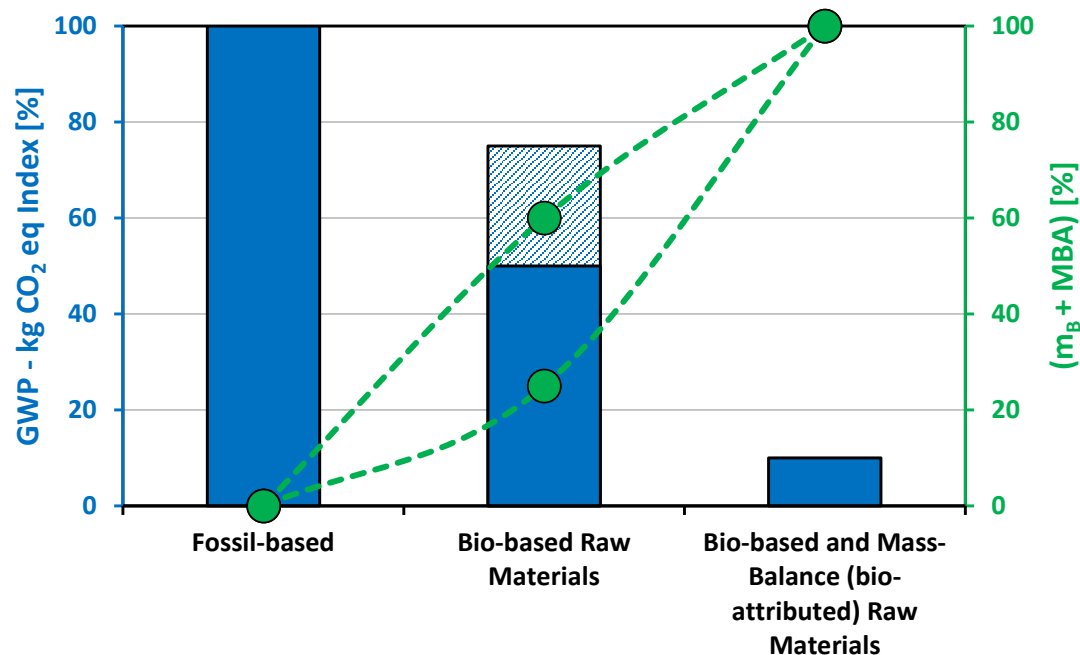


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Polynt Group – Case Study

Development of a GHG reduced UPR-based product

- The combination of the **Bio-Based Raw Material** approach together with the **Mass-Balance** (bio-attributed) **Raw Materials** allow to introduce up to **100 wt% of renewable content** in the final product resulting into **90% GWP reduction**



- The **GWP** value was calculated using the partial (cradle to gate) CFP ISO 14067 (IPCC 2021 AR6) environmental impact method, which includes biogenic carbon removals
- m_B is the bio-based content of the product, expressed as a percentage of the total mass of the dry matter of the product
- Mass balance approaches (MBAs)** do not establish a direct physical connection between input resources and the final product content. As a result, even if bio-based raw materials are absent from the product, it may still be labelled as bio-based. Consequently, the International EPD System currently holds that MBAs are not aligned with the ISO 14040 series and related standards, and therefore should not be used in EPDs

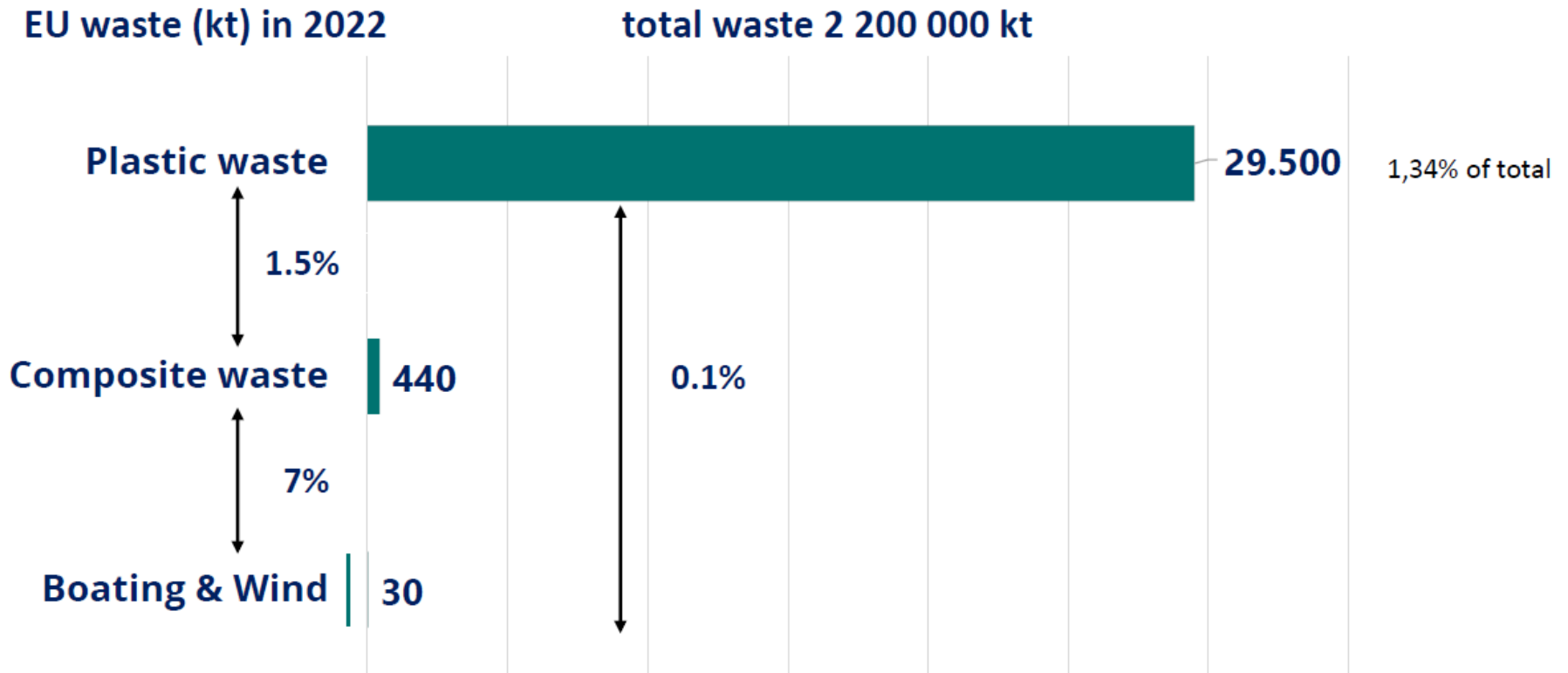
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Composites Material end-of-life Recycle

Small Volumes but Responsible Approach



Composites Material end-of-life Recycle



Recycling process	Recycling into cement	Mechanical recycling	Pyrolysis / Solvolysis / Pressolysis
Description	Re-use of raw materials (55-75%) plus energy recovery	Mechanical grinding of composite parts into smaller particles	Separation of fibre and matrix under heat and pressure (no oxygen)
Benefit	Reduction of CO ₂ footprint of cement production	Use of regrind in new formulations, replacing primary materials	Reclaiming fibre, organic fraction for further processing
Energy needed for recycling operation	Low	Low to medium	Medium to high
Operating cost	Low	Low to medium	Medium to high
Technology readiness	Demonstrated at industrial scale. Preferred current solution for glass reinforced composites	Demonstrated at industrial scale. Mostly suitable for glass reinforced composites, mostly for low percentages	Demonstrated in small-scale equipment. Promising results for glass fibre, commercial for carbon fibre composites
Matrix type	Mainly thermosets	Thermosets and thermoplastics	Thermosets and thermoplastics
Recycling type/ Circularity	Open loop	Open loop/Closed loop	Open loop/Closed loop
Fit in roadmap	In use now	In use now/Optimise	Develop

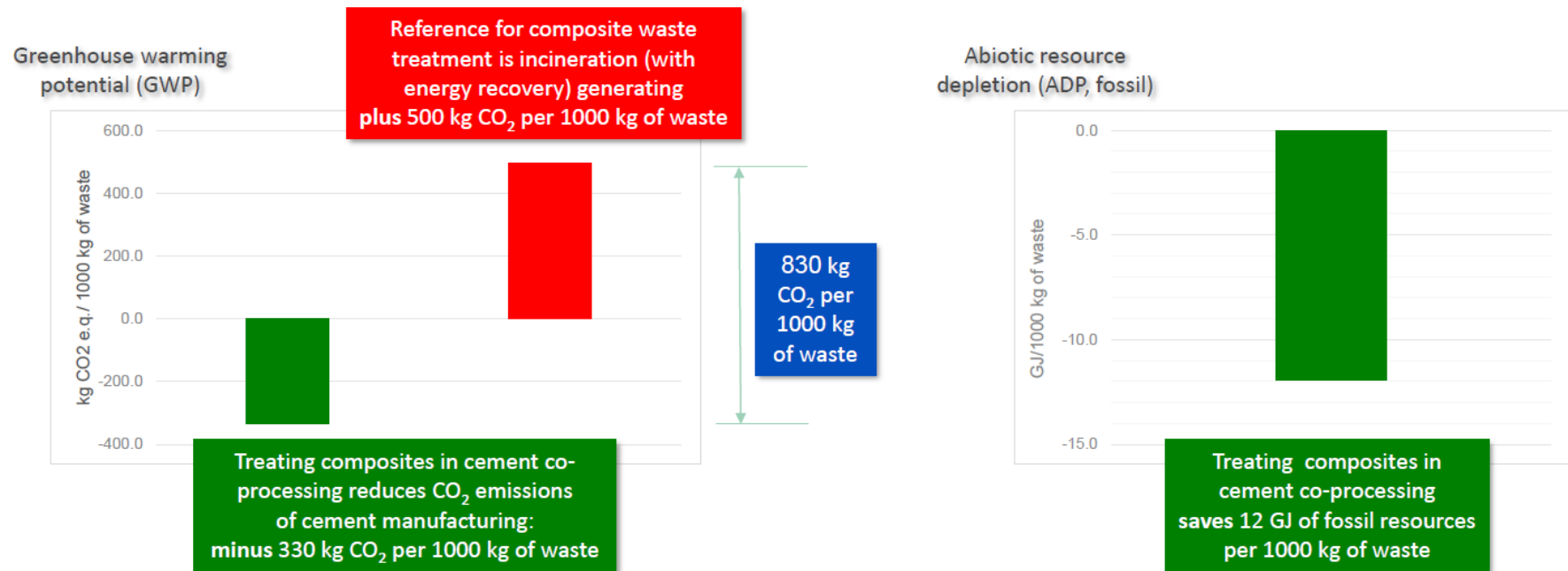
Source

EuCIA, Cefic

Composites Recycling into Cement

Cement Co-Processing Makes Sense for Treating End-of-Life Composites

1 ton of composite waste treated by co-processing into cement saves ≈ 830 kg CO₂ Vs incineration *



* Comparing composite waste vs. traditional cement raw materials and fuels (in this calculation: coal)

- LCA analysis has been completed
- Press release has been issued

Thanks for the kind attention

