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Economic and
environmental impact
analysis

Breakout Session 3
5 May 2020

REFUCOAT

BIO-BASED RECYCLABLE PACKAGING

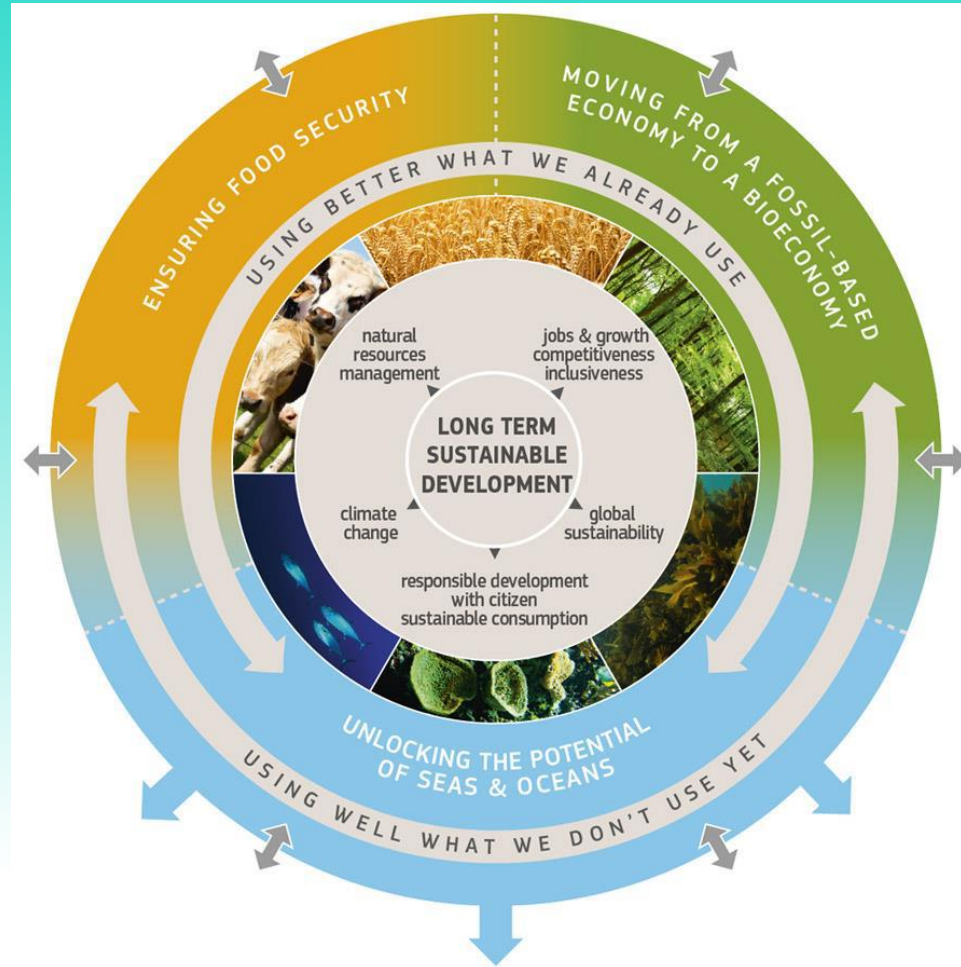


REFUCOAT: Economic and environmental impact analysis

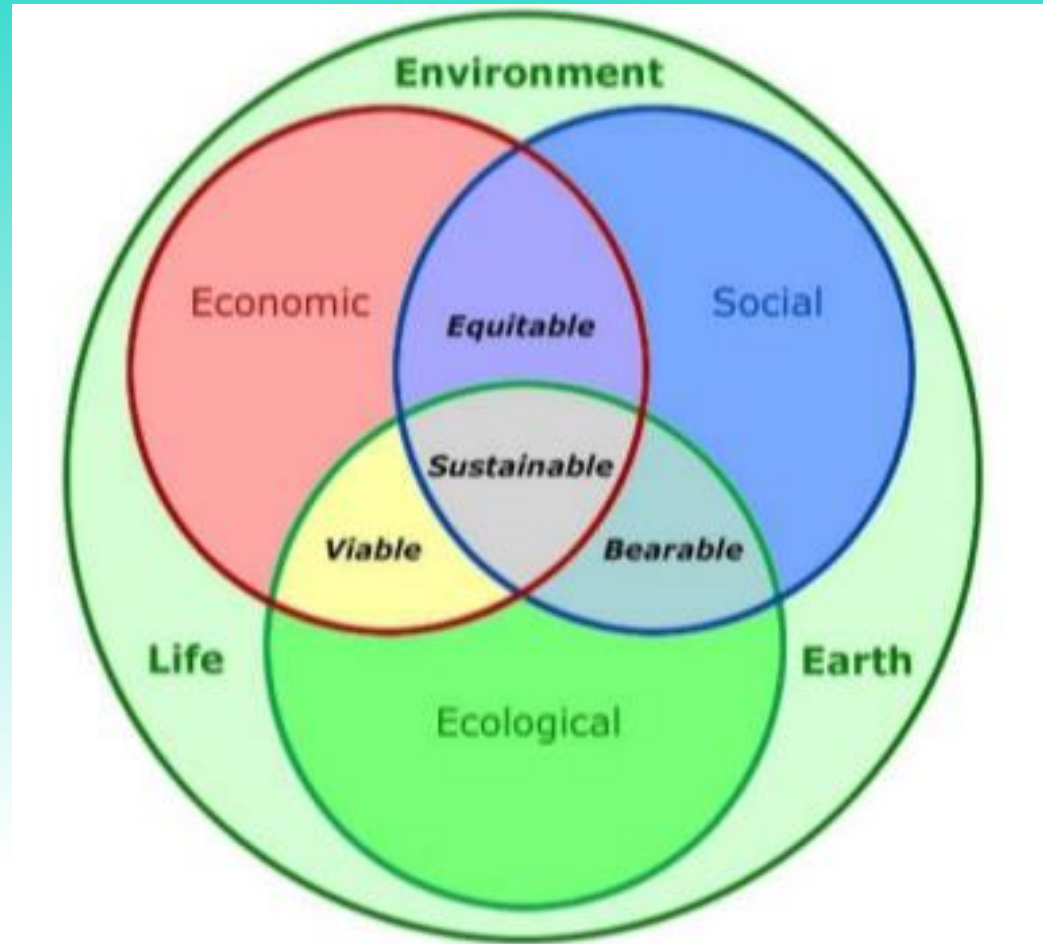
- Impact Assessment
- Economic Analysis
- Product Life-Cycle

Assessment

Impact assessment



Impact assessment



Impact assessment

- LCI Modelling
- EoL Inventory modelling
- Land Use modelling
- Interpretation, uncertainty and sensitivity analysis
- Generic LCAs data for fossil-based plastics
- Biodiversity Assessment

Impact assessment

Overall criteria	Sub-criteria	Overall criteria	Sub-criteria	Overall criteria	Sub-criteria	
Market potential	Types of jobs created				Product with innovative functionalities	
	No. of jobs created					
	Market size/volume in specific sectors in terms of total amount of products and incomes, both total and relative (to present market)				Development status of technology	New collaborations to enhancing synergies and coherence as compared to the production of the fossil-based reference product
	Relative projected market growth ⁵				Ensuring food security and safety	Innovation Use of scarce resources
Promise for deployment	Projected availability of feedstock (in terms of volume required, length of supply response & eventual technical/environmental/economic supply restrictions)				Potential sustainability benefits Direct and indirect land use change	
					LCIA data on potential environmental impacts	Relevance for key policies
	Possibility of exchanging the feedstock with a residual feedstock				Life cycle inventory data about feedstock	Policy opportunity Relevance for key policies

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REFUCOAT targets

- Final costs of packages are comparative with current petrol-based solutions.
- Environmental performance of the new materials and processes according to standards and EU legislation in force.

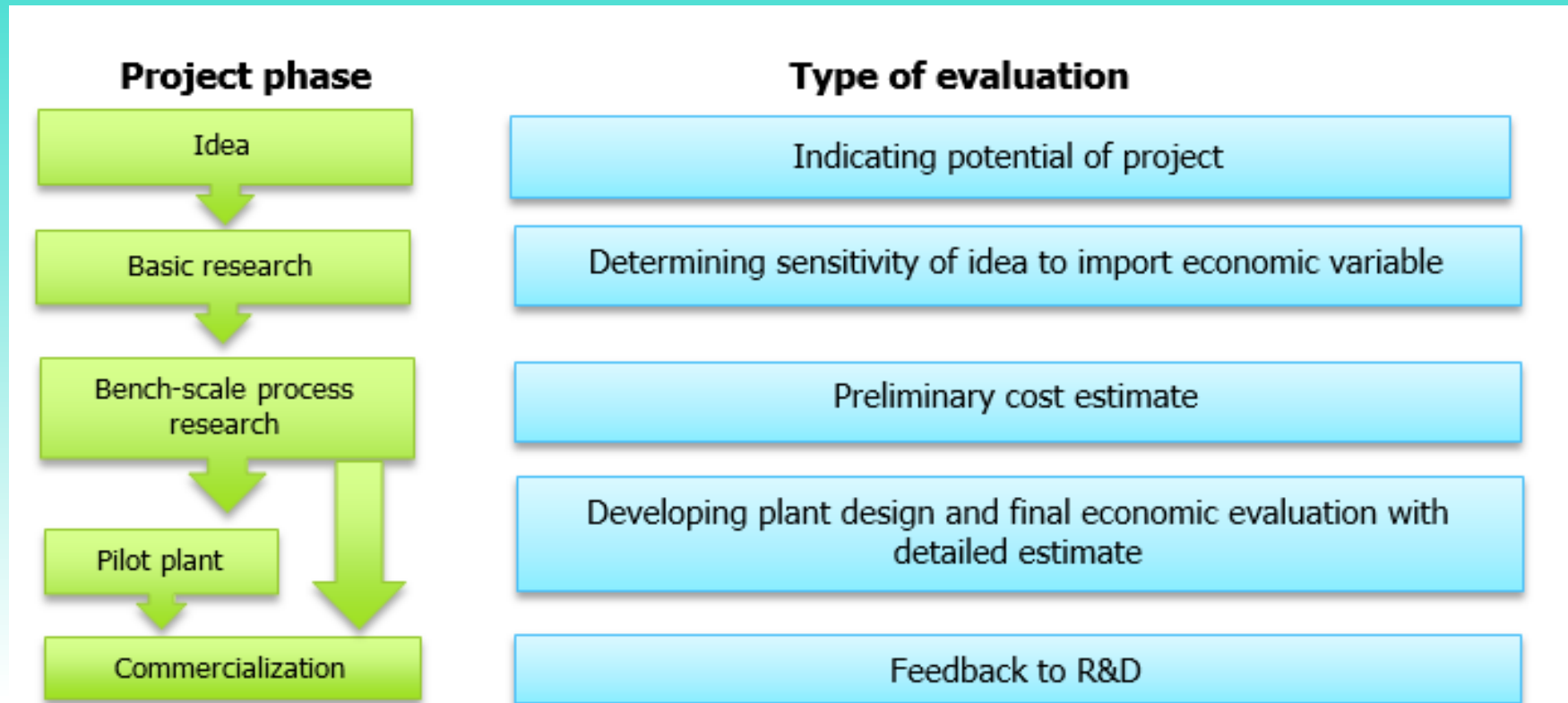
Economic analysis

Key questions

- Should the project be undertaken at all? The potential profitability, the inherent risk, the prospects of alternative projects, the enhancement of existing product lines, and over-all company policies must be taken into consideration.
- Should the project be undertaken at this time? Trends in markets, the company's financial resources, and the economy in relation to expansion must be explored.
- In this the proper method for the project? Alternative technical and economic procedures as well as different raw materials and intermediates must be studied..

Economic analysis

Key questions



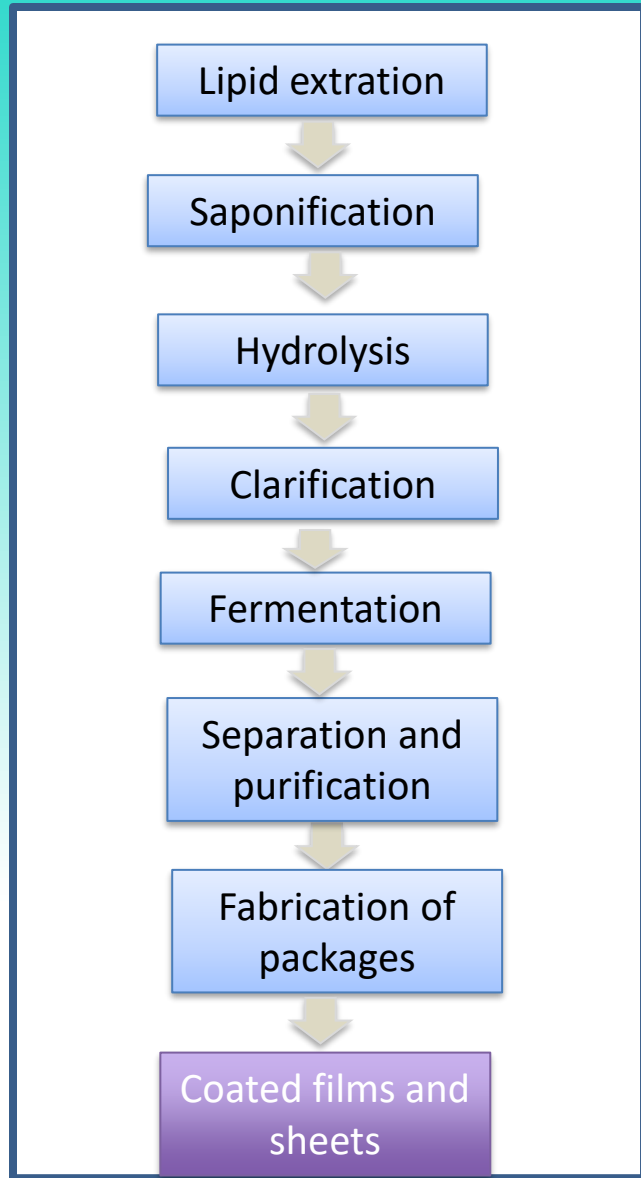
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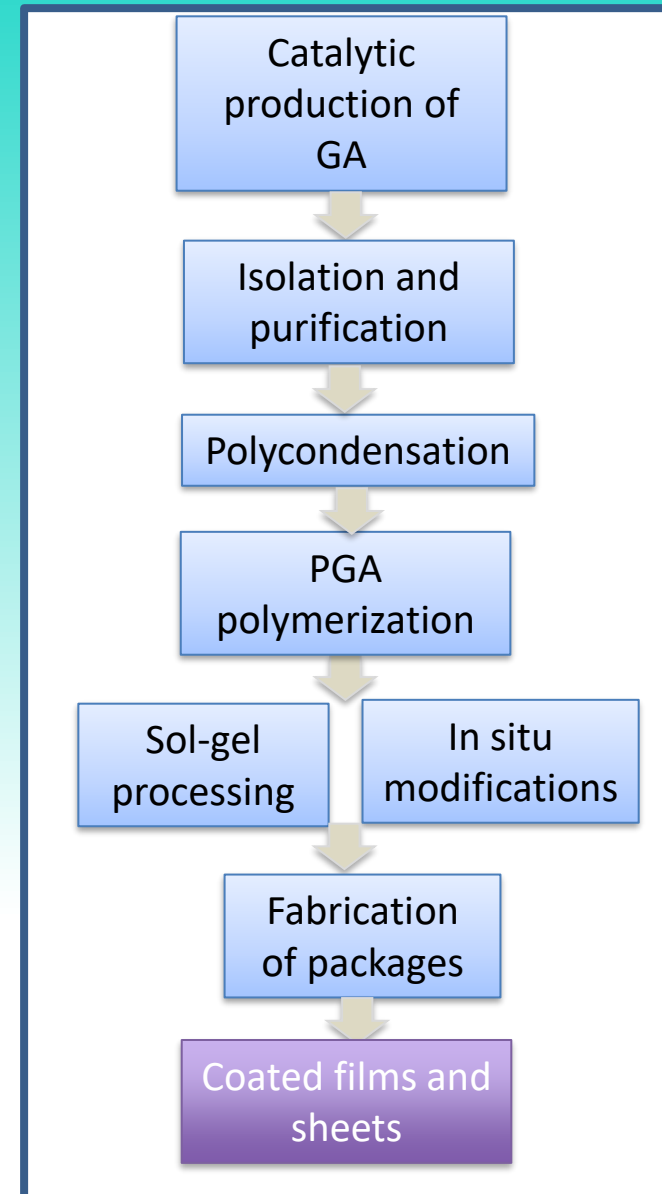


Definition of the processes

PHA based packaging



PGA and hybrid coatings



Task 6.1 Economic analysis

SUBSTRATES

Production volume

Associated cost/returns

%Cmol - %solid content

Pretreatments

Logistics

Legal considerations

PRODUCTS

Benefits

DSP Requirements

Yields(%Tn/Tn)

Productivity (Tn/(m³·h))

Concentration (kg/m³)

Purity(% kg/kg)

Techno-economical viability

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Economic analysis: methodology

The methodology followed in this study is based on economic evaluation model (Plant Design and Economics for Chemical Engineers, 5th edition, Peters, Timmerhaus and West

The main input data categories include:

- Capital investment: Equipment Costs
- Materials & Labor: the product prices and flowrates, the raw material prices and flow rates, and the labor requirements
- Utilities: the amount of each utility needed annually in appropriate units.
- Depreciation: the equipment costs by selected depreciation method.
- **Annual total costs:** the summary of all costs inputs
- **Evaluation:** profitability measures are used for economic analysis

Economic analysis

- **Preliminary economic evaluation was performed by M18**

Results: Both PHA based packaging and PGA and hybrid coatings processes represented negative preliminary results on such financial and economic parameters as annual gross profit, annual net profit, annual operating cash, total annual cash flow, profitability measures such as return on investment and payback period. The partners identified several reasons of preliminary negative results and contingency plan of action. Mid-term economic evaluation was agreed to be performed by M30.

- **Mid-term economic evaluation was performed by M30**

Results: Due to the implementation of the Action Plan defined in the Preliminary Report, both mid-term estimations represent positive mid-term results on such financial and economic parameters as annual gross profit, annual net profit, annual operating cash, total annual cash flow, profitability measures such as return on investment and payback period.

Economic analysis

- **Update the assumption for costs and prices: during the preliminary report, the problem was identified related to the laboratory based costs inputs which significantly differ from market prices for industrial equipment, facilities, raw materials and utilities costs.**
- **The process optimization of both PHA based packaging and PGA and hybrid coatings was performed, increasing the process yield at most of the stages:**
 - Optimization of PHA production and purification and scale-up to pilot scale
 - Optimization of GA production, catalyst production and reuse of catalyst was achieved up to 10 times of reuse without further treatment.
 - Optimization of GA polycondensation and polymerization stages.

Product Life-cycle Assessment

- LCA approach was used to compare bio-based and non bio-based products withing the same LCA framework.
- Environmental performance of the new materials and processes according to standards and EU legislation in force.
- The results obtained will first of all help us compare if the Products developed in the Project have better performance that the conventional ones.
- Commercial and marketing strategy

Product Life-cycle Assessment

The LCA was conducted in accordance with the ISO guidelines (ISO 14040 and ISO 14044) and EN 16760 (CEN, 2015):



1st Data Collection

2nd) LCA assessment

- Methodology: Standard pas 2050 (UK)
- Environmental Assessment software (simapro)



Thank you!!

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