



Integrating Life Cycle Assessment And Eco-design Strategies For a Sustainable Production of Bio-based Plastics

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1. INTRODUCTION
2. ECO-DESIGN FOR BIO-BASED PLASTICS
3. REFERENCE PRODUCT
4. ECO-DESIGN STRATEGIES
5. OPPORTUNITIES AND CHALLENGES
6. CONCLUSION

Introduction



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- **Plastics have become an integral part in our lives with versatile applications**
- **The majority of plastics are petroleum-based**
- **The finiteness of crude oil resources & global climate change have brought bio-based plastics into focus**
- **Emphasis to be made to improve the design of bio-based plastic products, making it as a sustainable alternative**



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Eco-design for bio-based plastics



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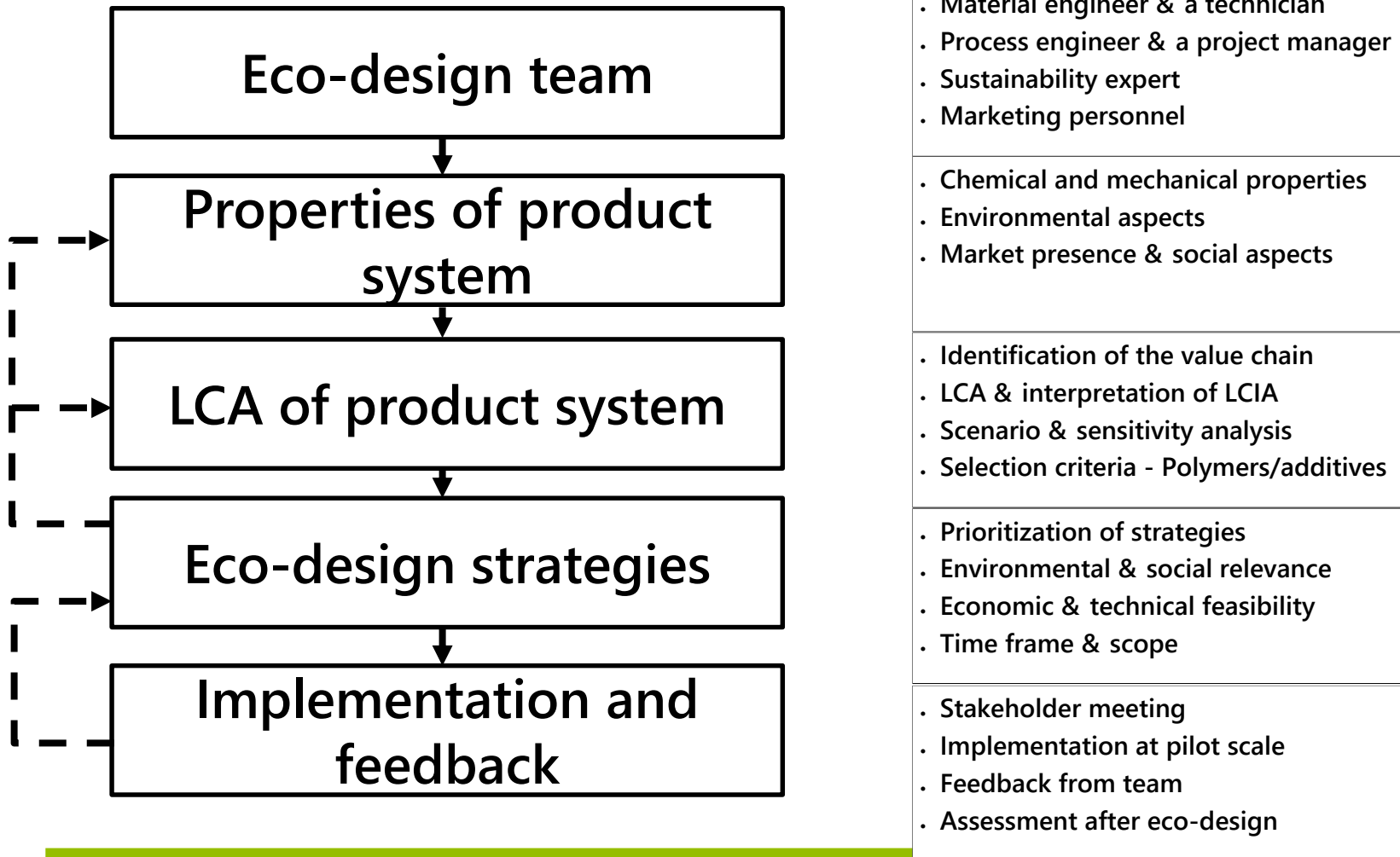
- **Eco-design integrates the environmental aspects of products into product design and development**
- **Apart from having a life cycle perspective, it helps to improve design strategies in the business context**
- **Think beyond the usage of renewable raw materials as an eco-design measure.**
- **Many eco-design studies conducted on other bio-based products, but very few in bio-based plastics sector**

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Reference product

- **Body of a computer mouse made of bio-based plastics**
- **Mechanical properties of different polymers were analyzed**
- **LCA of the blend was done on a cradle-gate basis**
- **Secondary data was predominantly used, except for the production and processing phase.**
- **LCIA, hotspot and scenario analyses were analyzed along with mechanical properties to identify strategies**

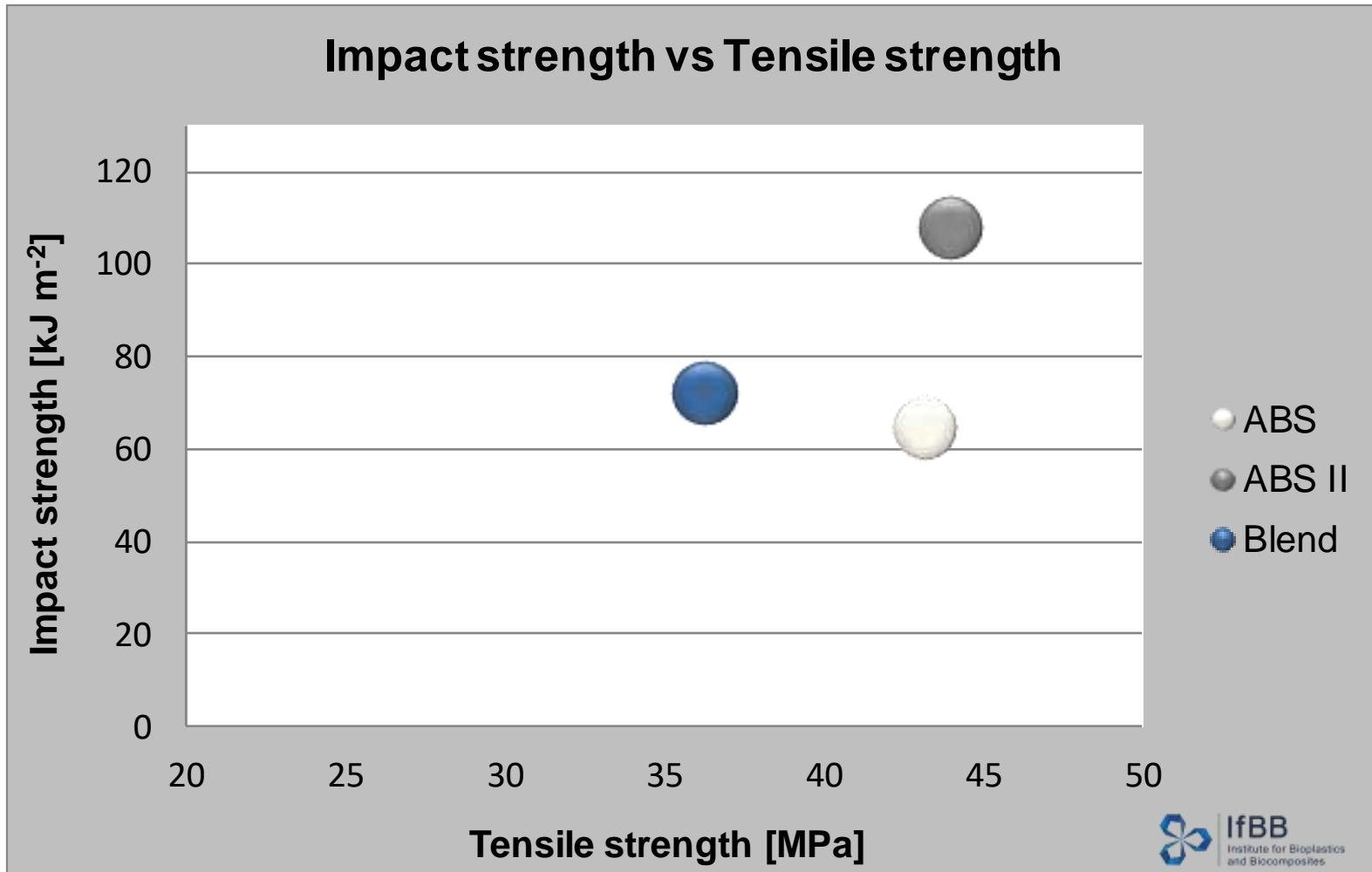


Reference product



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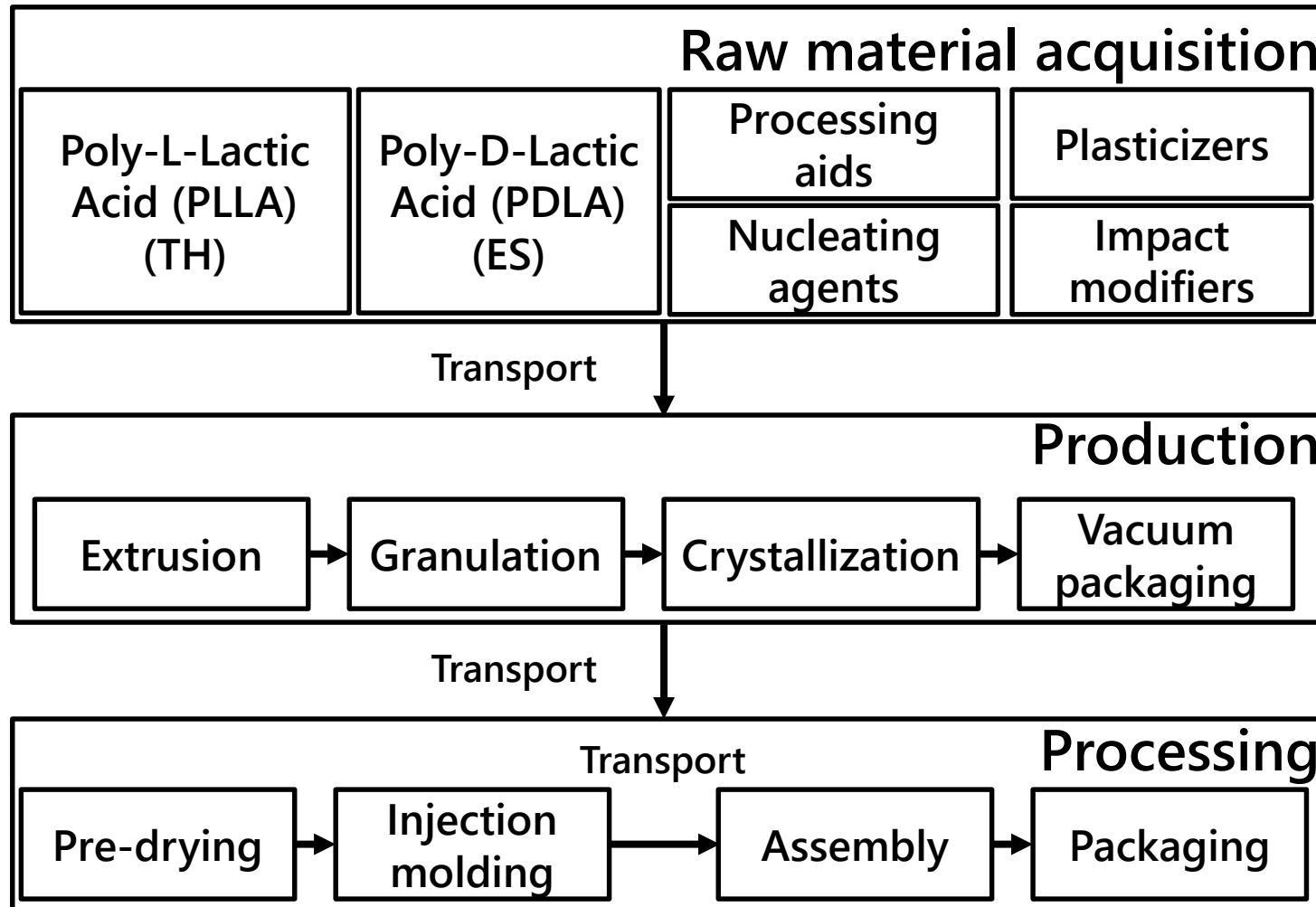


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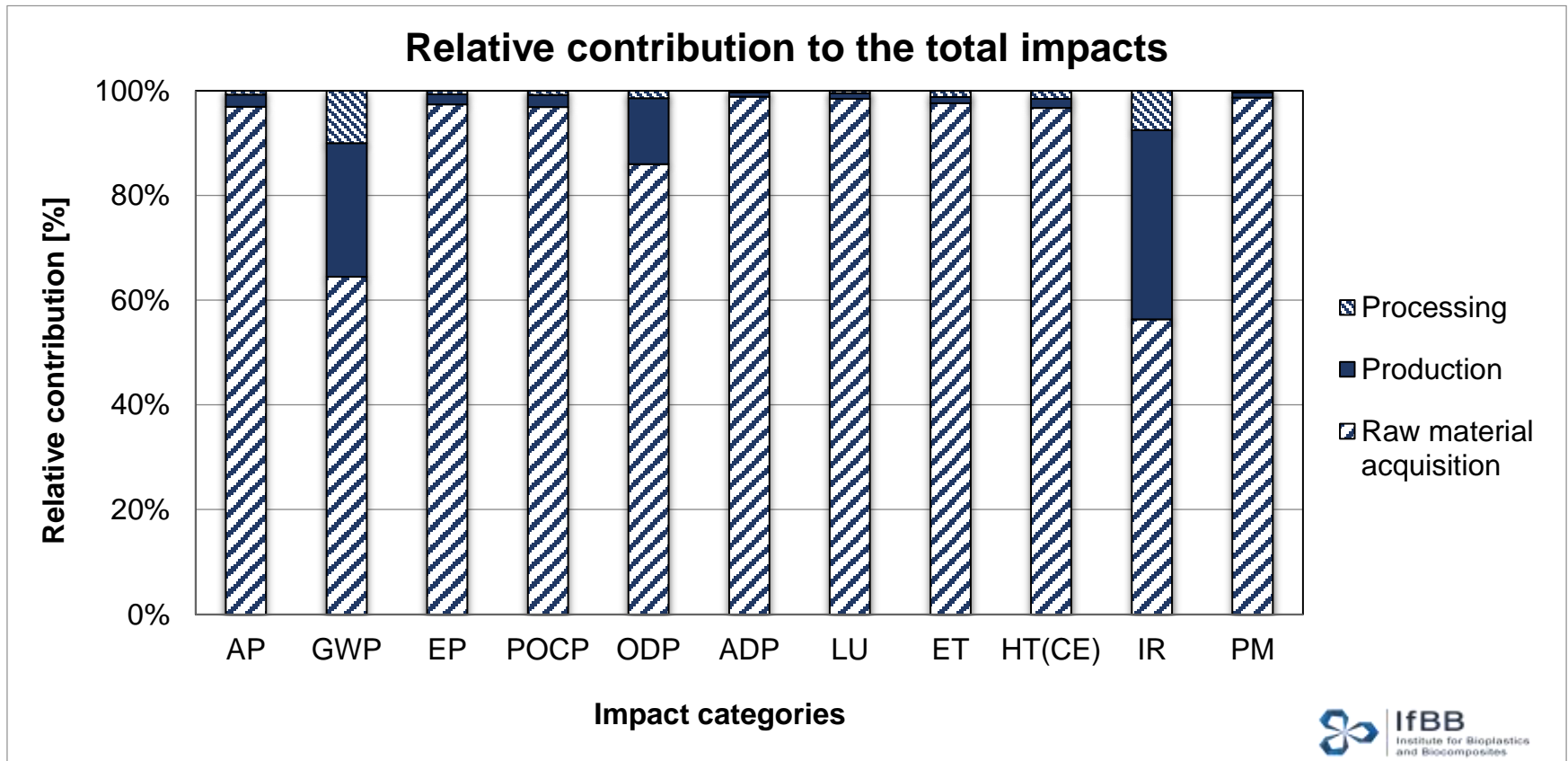


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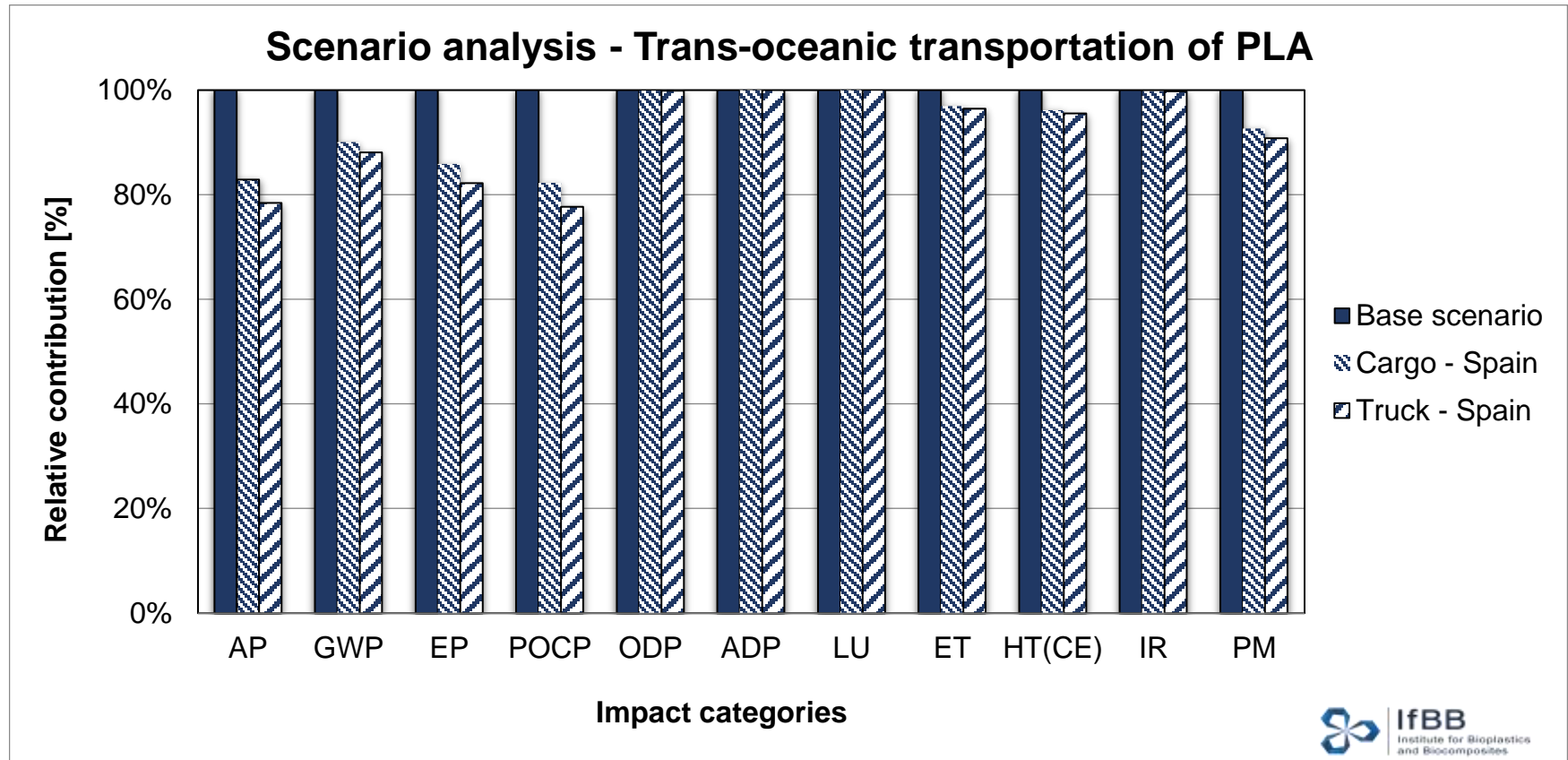


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Eco-design strategies

Strategy	Environmental improvement	Economic feasibility	Technical feasibility	Timeframe
Sourcing of local raw materials	4	2	5	Long Term
Bio-based additives	3	2	3	Medium Term
Primary data	2	5	4	Short Term
Mechanical properties	3	2	2	Medium Term
Ergonomics	4	2	2	Medium Term
Recyclability	5	1	4	Medium Term

Scale: 1-5, with 1 being least feasible and relevant, 5 being highly feasible and relevant



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Opportunities and Challenges

- **Opportunities**

- Increase the lifespan of the bio-based plastics products
- Expand the application areas
- Improvement from sustainability point of view
- Increase the marketability

- **Challenges**

- Stakeholder engagement
- Investing time and money
- Transparent communication



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Conclusion



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- **LCA of a blend, made of bio-based plastics was done**
- **Eco-design strategies were taken from the results of LCIA, scenario analysis and mechanical properties of the blends**
- **The proposed eco-design strategies are then discussed with the stakeholders with the feasibility and timeframe**
- **The impacts of the product after applying these eco-design measures need to be studied**
- **These measures could pave way to design and manufacture sustainable bio-based plastics products**



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THANK YOU FOR YOUR ATTENTION

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