

Putting the metrics behind sustainability.



Bicycle manufacturer Comparative LCA of three materials for bike frames

The challenge

According to a study by [Fietsersbond and beslist.nl](#), the Netherlands has 17 million inhabitants and 22.5 million bicycles. On average 1.3 bike per capita, more than in any other nation. You might think that a bicycle is already an environmentally friendly solution with no need for improvement. Still, important decisions can be made at the design level.

For a novel way of manufacturing bicycles, our client was searching for alternative materials that might improve their environmental performance. The material of the bike frame greatly affects the weight, durability, cost and environmental impact of the overall product. Therefore, our client wanted to understand the environmental burdens and benefits of three materials they were considering using for bike frame production.

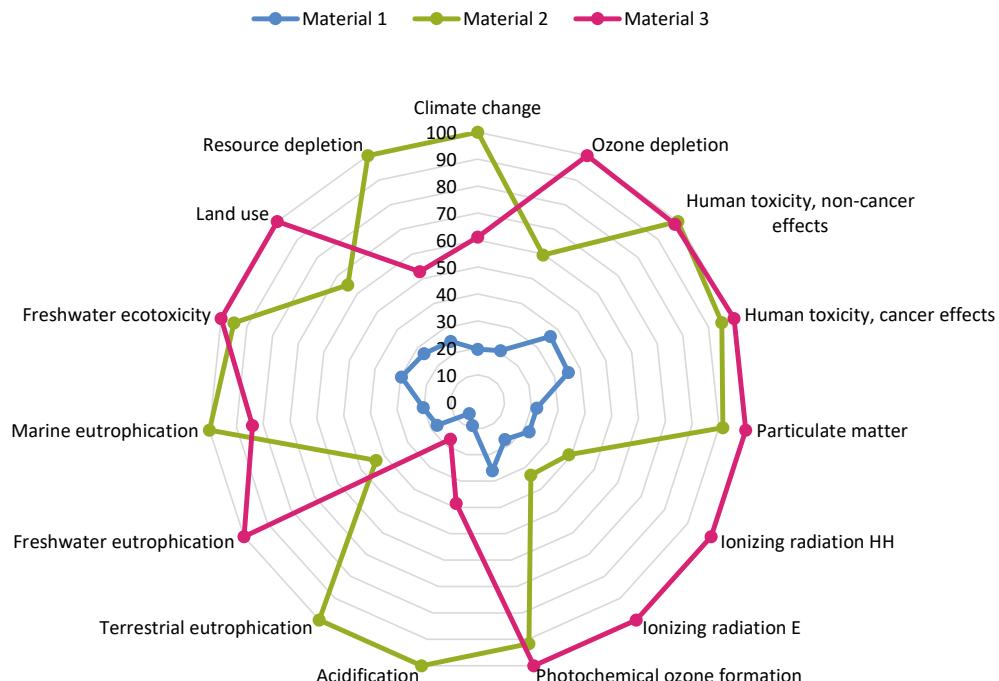
PRé solution

PRé conducted a comparative life cycle assessment (LCA) of the three materials, covering a wide range of environmental topics with the ILCD 2011 Midpoint method and adding water scarcity assessment with the AWARE water footprinting method.

To produce one bicycle, different amounts of each material are needed. Therefore, the functional unit of this LCA was 1 bike frame, rather than 1 kg of material. The model included production of the raw materials, manufacturing of the bike frame and the end-of-life stage. The use phase was excluded because the choice of material does not affect the bike's lifetime.

We developed a parameterised model that could be used to assess all three materials. The parameters allow us to change the type and amount of material to compare three variations of bike frame with the same model. Such a parameterised model does not only save time, its external Excel spreadsheet is also easily adaptable for the future.

Valuable insights into the environmental performance allowed the manufacturer to choose the material with the lowest environmental impact.



Comparison of three bike frames, produced using alternative materials - characterised results, calculated with ILCD 2011 Midpoint+

The results revealed that Material 1 was the best choice from an environmental perspective – it had the lowest impact in every category. Material 2, with the highest impact in six categories, scored better than Material 3, which caused the highest environmental pressure in nine categories. To better understand the results, we also analysed the main contributors of each bike frame. To test the consequences of the most important choice made in the study – selection of mass vs economic allocation – we did a sensitivity analysis. Regardless of the allocation factors chosen, Materials 3 had the highest impact in the majority of categories and its single score results exceeded the other two materials.

Business value

- The bicycle manufacturer gained valuable insight into the environmental performance and the hotspots associated with the three materials, allowing them to choose the material with the lowest environmental impact and to focus their improvement activities on the processes with the highest environmental impact.
- The LCA showed potential value when producing bicycles from Material 1. The insights of this study can be used when setting up the production facility and to increase their competitive advantage.
- The LCA model was made flexible with the use of parameters. This allows the bicycle manufacturer to easily switch between the different materials or update the model. In the future, they will be able to efficiently reuse this model for an updated or follow-up study that incorporates updates in methodology or data collection.



Creating business value through sustainability metrics

Sustainability metrics consulting

Sustainability in business has become a core business concern and a driving factor in creating business value. PRé offers a range of consulting services, provided by a team of experts who will work with you to choose, create and deliver the right metrics for your sustainability goals.



Developing innovative new metrics for new challenges

Societal and stakeholder expectations for implementing sustainability in business are becoming more demanding. Sometimes, off-the-shelf metrics cannot help you answer their questions. PRé has extensive experience in life-cycle-based metrics pioneering: implementing cutting-edge new product metrics and developing completely new, scientifically sound and robust metrics. PRé has been the driving force behind many ground-breaking initiatives like ReCiPe or the Handbook for Product Social Impact Assessment.



Integrating sustainability metrics in your business

To create business value from sustainability, your business needs to integrate sustainability metrics across its business functions. You can't improve what you can't measure. PRé has the expertise required to help you choose the right metrics and to integrate sustainability into your day-to-day operations. PRé also supports you in increasing the efficiency of your LCA work and in empowering your LCA practitioners.



Expert LCA knowledge to measure sustainability performance

LCA has proven to be a robust and science-based way to measure and communicate your sustainability performance. PRé can review your LCA studies, deliver EPDs, footprints and other metrics, and provide you with completely new LCA studies to measure your impact. Our consultants are renowned for their expertise in specific topics, such as impact assessment, uncertainty, normalisation, toxicity, social sustainability and databases. PRé offers training courses and in-house training that build a solid knowledge base to help you conduct LCA studies yourself.

Market-leading businesses that create value from sustainability metrics

PRé has built a worldwide reputation as a leader on environmental and social impact assessment. We work with organisations and institutes such as the European Commission, European Space Agency, Heineken, Philips, L'Oréal and DSM.



About PRé

PRé has been a leading voice in sustainability metrics and life cycle thinking, since 1990, pioneering the field of product and supply chain sustainability metrics. We've developed some of the world's most widely recognised and applied environmental impact assessment methods, as well as the world's leading LCA software, SimaPro. From the very first, we have not only focused on developing the science of LCA, but also its application – helping companies create value by using state-of-the-art measuring, monitoring and analysis methodologies to improve their sustainability performance.

Get in touch with PRé

We are always happy to discuss your sustainability challenges with you - feel free to contact us.

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We look forward to being your partner in putting the metrics behind sustainability.

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