STRENTHENING THE TRANSITION TO CIRCULAR ECONOMY BY LCM

Mélanie Guiton[1], Enrico Benetto[1], Alina Beloussova[1], Thomas Schaubroeck[1], Feliks Bezati[2]

[1]Luxembourg Institute of Science and Technology

[2]Tarkett

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CONTEXT AND OBJECTIVE

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- **Industries need some methods and tools** to set up strategic targets in support to the transition to a circular economy, and to identify the means to pursue them:
  - **Circular economy principles provide technical guidance** for keeping products, components and materials at their highest utility and value at all times.
  - **LCA evaluates quantitative potential environmental impacts**, with the final aim of reducing them while keeping or improving the functionality of products.

➢ **Objective of the presentation:** Discussing the potential of LCA for evaluating the consequences induced by the implementation of a circular system, based on an industrial case-study.

CASE STUDY

Linoleum flooring post-use valorisation

- Linoleum produced by Tarkett – more than 2 Mm^2/year
- Made of more than 80% renewable raw materials.
- Awarded with the C2C Silver Certificate

- **Tarkett aims at improving linoleum post-use valorisation through**
  - **The implementation of a take-back system**
  - **An increase of recovered and recycled post-consumer products**

- **LCA was performed in order to identify unforeseen hotspots and avoid burden shifting**

IMPROVING POST USE VALORISATION
Scenarios definition

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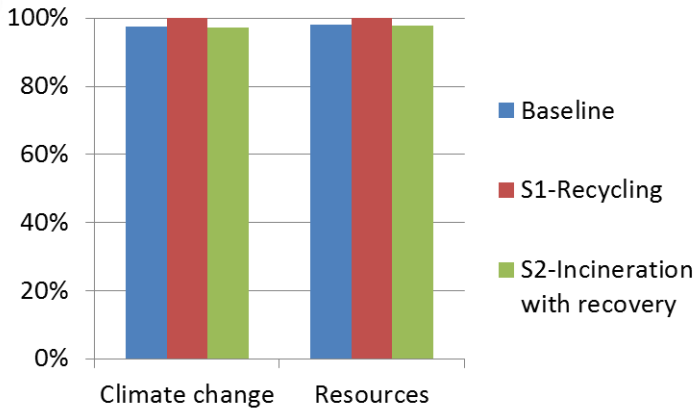
Considering the entire product life cycle

- **1 baseline scenario** reflects the current situation for the treatment of linoleum post-use scraps
- **2 hypothetical alternative scenarios** were set by Tarkett

Baseline Scenario	0% recycling post-consumers scraps
Change for Linoleum post-use scraps treatment compared to baseline	
Alternative Scenario 1 – Recycling –	**+ 45% closed-loop recycling** post-consumers scraps.
Alternative Scenario 2 – Incineration with recovery –	**+ 45%** post-consumers scraps sent to **incineration with energy recovery** and **recycling of TiO2 and calcium carbonate from ashes .**

ATTRIBUTIONAL LCA RESULTS

Baseline scenario compared to alternative scenarios



- Very low differences between the three scenarios.
- Contribution analysis on the whole product life cycle is governed by
  - Fossil fuel consumption,
  - Transportation in the take back system.

➢ **Based on the results from attributional LCA, the observed differences are not significant enough to choose one option more than the other.**

LINOLEUM CIRCULAR SYSTEM

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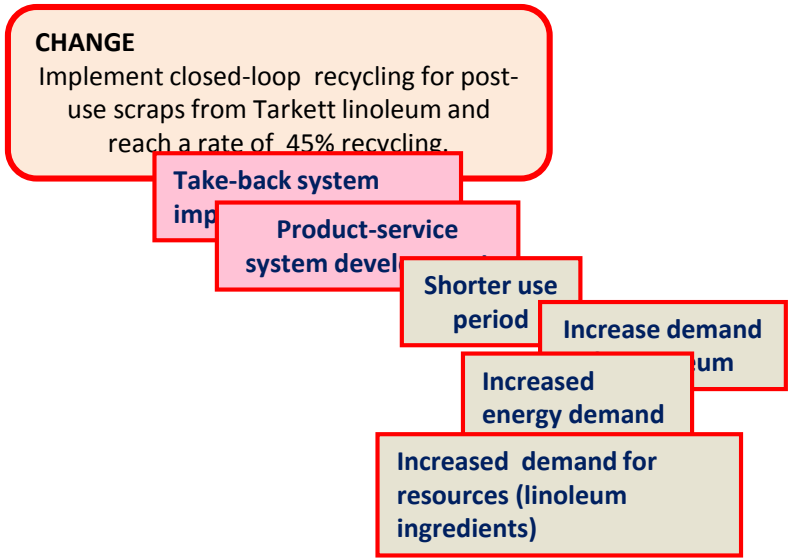
Scenario 1 - Intermediate Milestones and consequences induced by the change



LINOLEUM CIRCULAR SYSTEM

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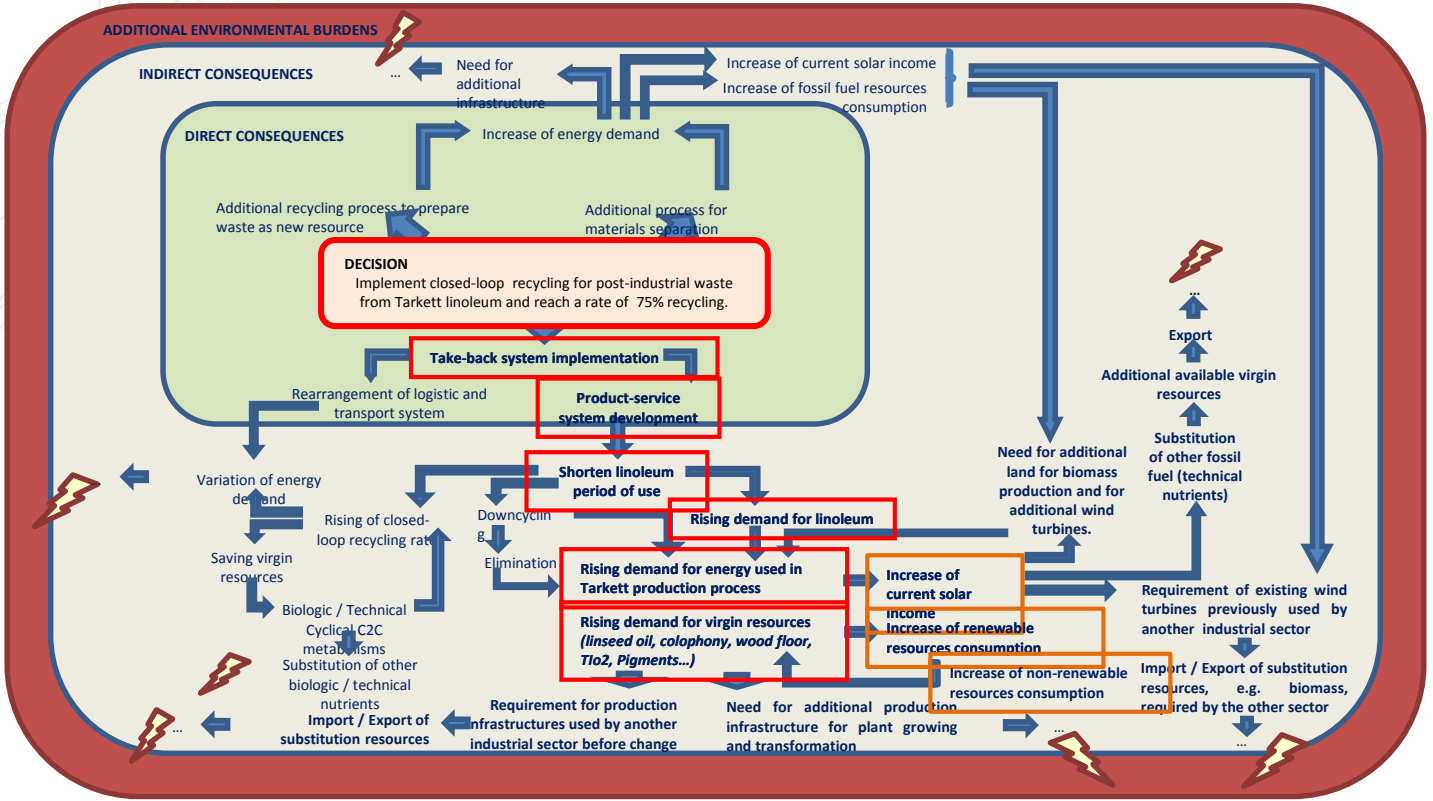
Environmental consequences should be assessed.



IMPROVING POST USE VALORISATION

Consequences observed in alternative scenarios

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Simplified and non exhaustive chain of consequences considered in the case study

Change in Lino scrap treatment

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Direct consequence 1
Variable recycled content in recipe

Direct consequence 2
Raw materials substitution

Direct consequence 3
Rising of energy consumption for recycling

Direct consequence 4
Take back system implementation

Direct consequence 5
Avoided post-use traditional elimination process

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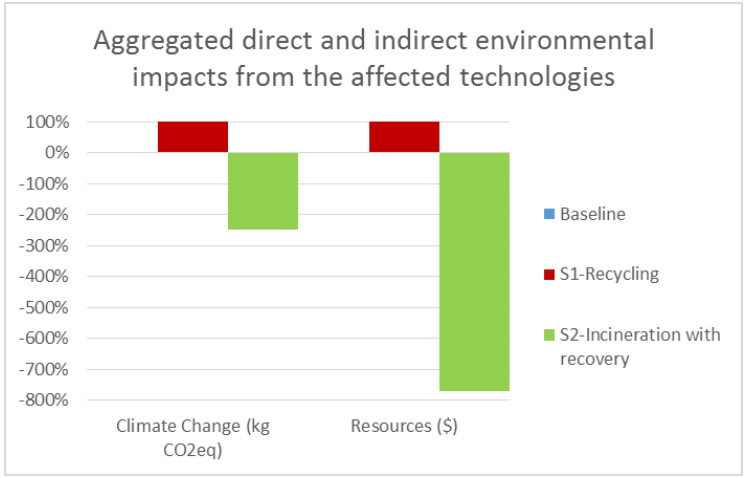
Indirect consequences

Rising demand for electricity production and transportation infrastructure

Saving of electric and thermal energy production

CONSEQUENTIAL LCA RESULTS

For the two alternative scenarios



- Aggregated direct and indirect environmental impacts variations induced by a change in the post-use treatment of the product.
  - **Alternative Scenario 1**: avoided impacts from the production of raw materials replaced by recycled linoleum
  - **Alternative Scenario 2**: avoided impacts from the recovery of titanium dioxide and calcium carbonate on one side, and avoided electricity and heat production due to energy recovery from linoleum incineration.

➢ **The consequential perspective allows differentiating the alternative scenarios.**

PROPOSAL FOR FULL SCALE ASSESSMENT

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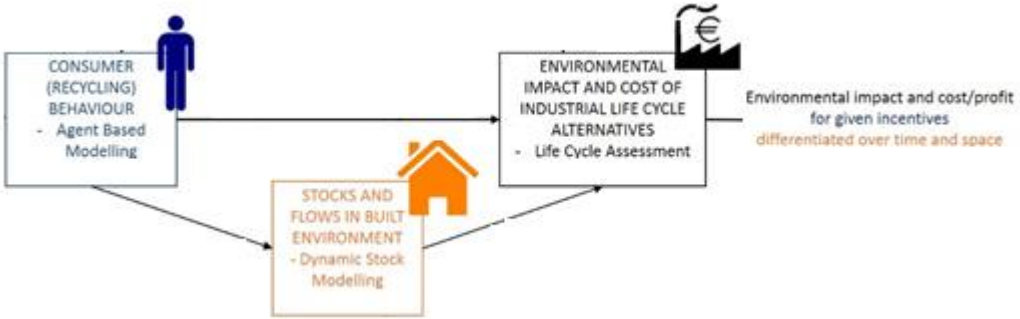
- Consumer behaviour modelled through Agent-based modelling
- Quantification of products in use and of waste generated over time for a defined period, in a specific region, made with Material Flow Analysis
- Combination with LCA



CONCLUSIONS

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- **Consequential LCA is of particular interest**
  - When the transition towards a circular model induces significant technical variations beyond the direct system boundaries affected by the change.
  - In order to demonstrate the presence of potential additional impacts, based on the modelling of the change and its consequences.
  - In support to decision making for strategic purposes

THANK YOU!

Mélanie Guiton
R&T Associate – LIST
melanie.guiton@list.lu

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