# STRENTHENING THE TRANSITION TO CIRCULAR ECONOMY BY LCM

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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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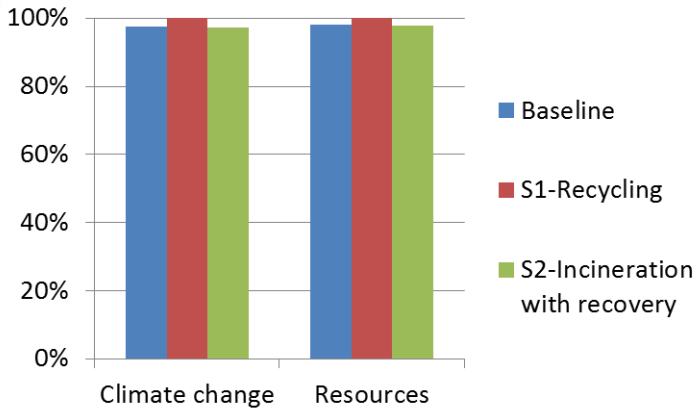
**Considering the entire product life cycle**

- **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<br>post-consumers scraps |
| **Change for Linoleum post-use scraps treatment compared to baseline** | |
| **Alternative Scenario 1<br>– Recycling –** | **+ 45% closed-loop recycling** post-consumers scraps. |
| **Alternative Scenario 2<br>– 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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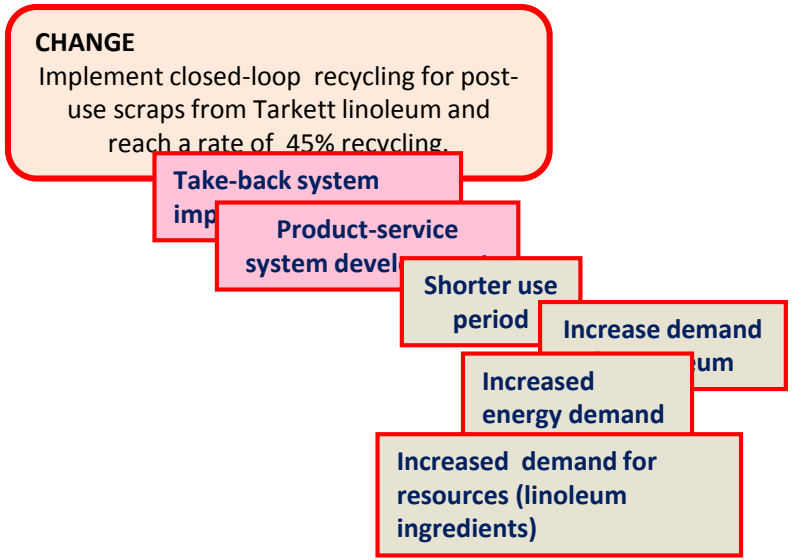
## Scenario 1 - Intermediate Milestones and consequences induced by the change



# LINOLEUM CIRCULAR SYSTEM

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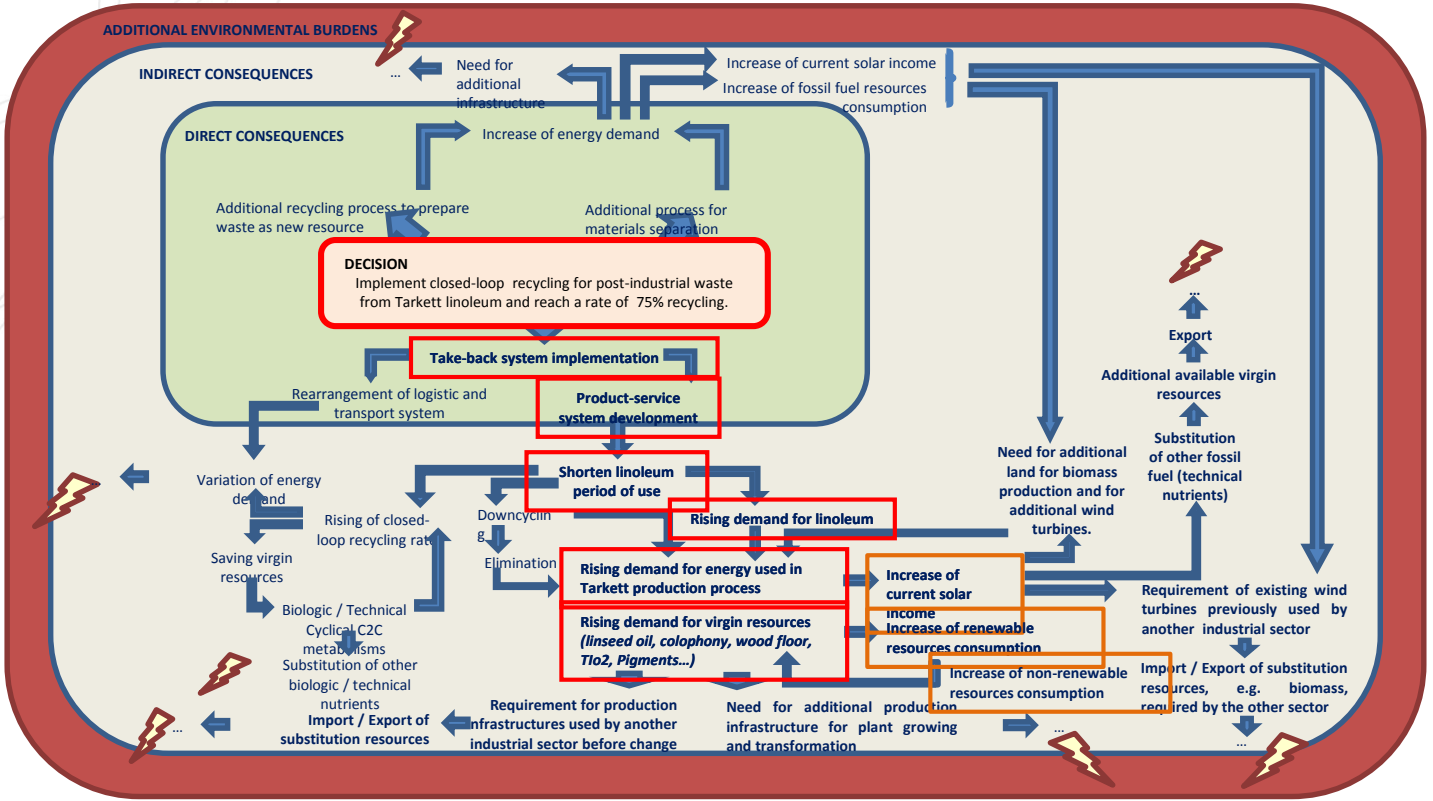
## Environmental consequences should be assessed.



# 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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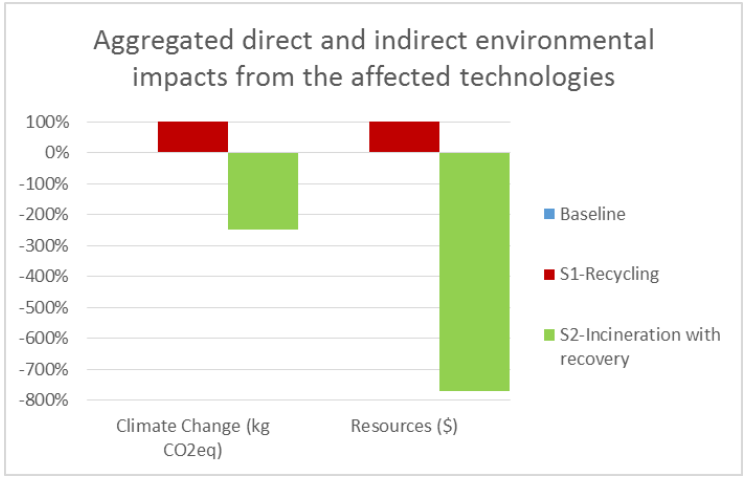
**Indirect consequences**

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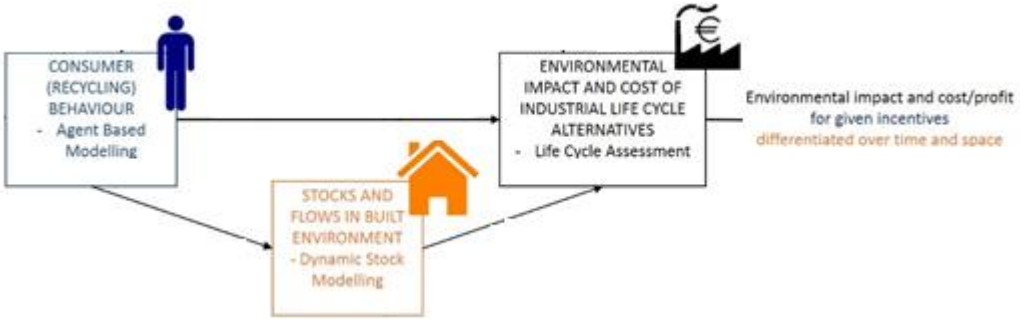
- Consumer behaviour modelled through Agent-based modelling
- Quantification of products in use and of waste generated over time for a defined period, in a specific region, made with Material Flow Analysis
- Combination with LCA



# 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!

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