

The linkage between plastic circularity and carbon reduction: scenario analysis for belgium 2023, 2030, 2040

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- Final presentation -

Introduction

PPWR

Packaging and Packaging Waste Regulation

Targets for **re-use**

Transport between member states

2030 40%

A horizontal bar chart showing a target of 40% for the year 2030. The bar is divided into a dark red segment representing 40% and a light red segment representing the remaining 60%.

2040 70%

A horizontal bar chart showing a target of 70% for the year 2040. The bar is divided into a dark red segment representing 70% and a light red segment representing the remaining 30%.

Transport in member states or
between sites of a company in EU

2030 100%

A horizontal bar chart showing a target of 100% for the year 2030. The bar is entirely dark red, indicating that the target is 100%.

Targets for **recycling**

Plastic packaging waste

2025 50%

A horizontal bar chart showing a target of 50% for the year 2025. The bar is divided into a dark red segment representing 50% and a light red segment representing the remaining 50%.

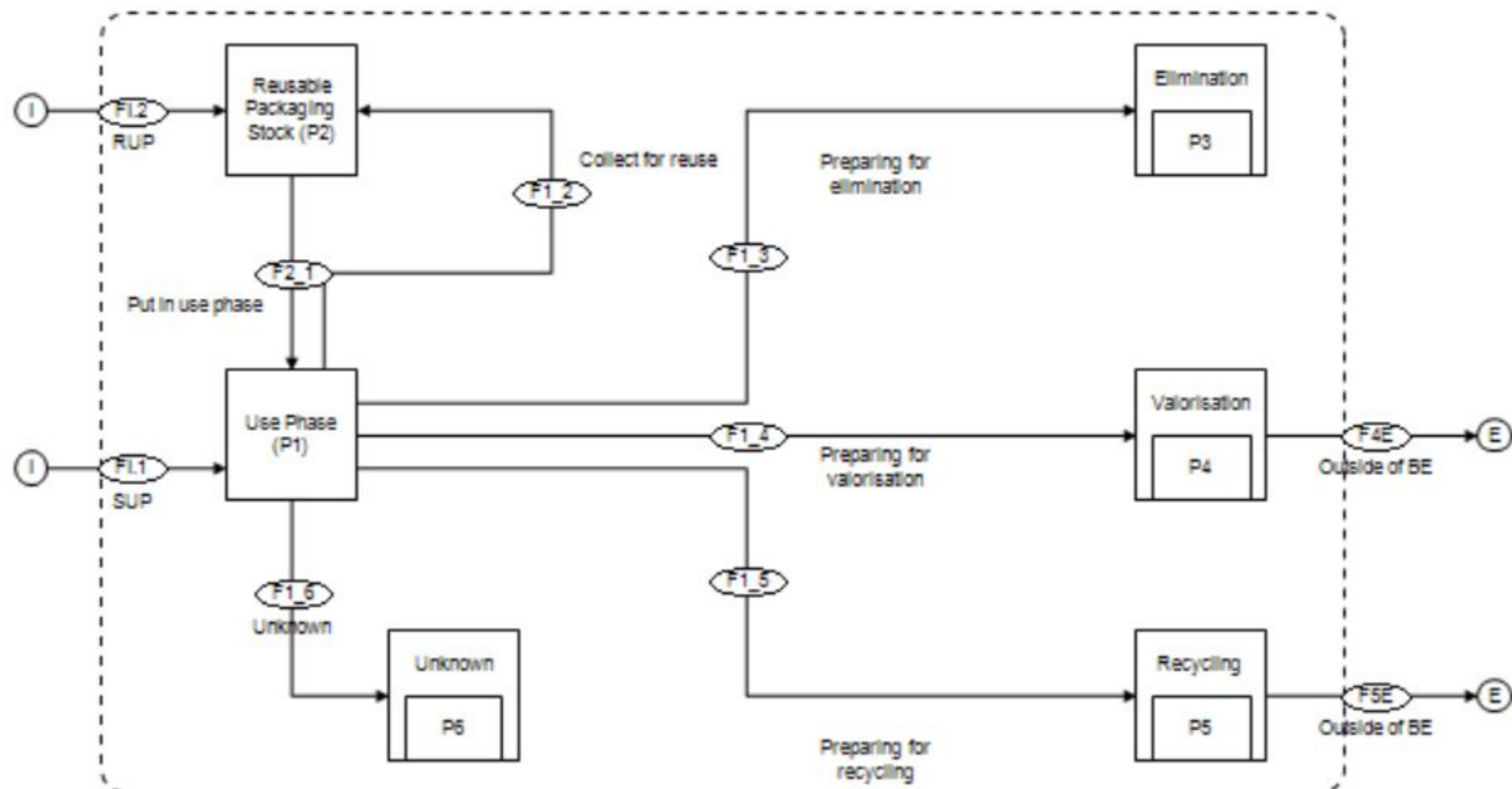
2030 55%

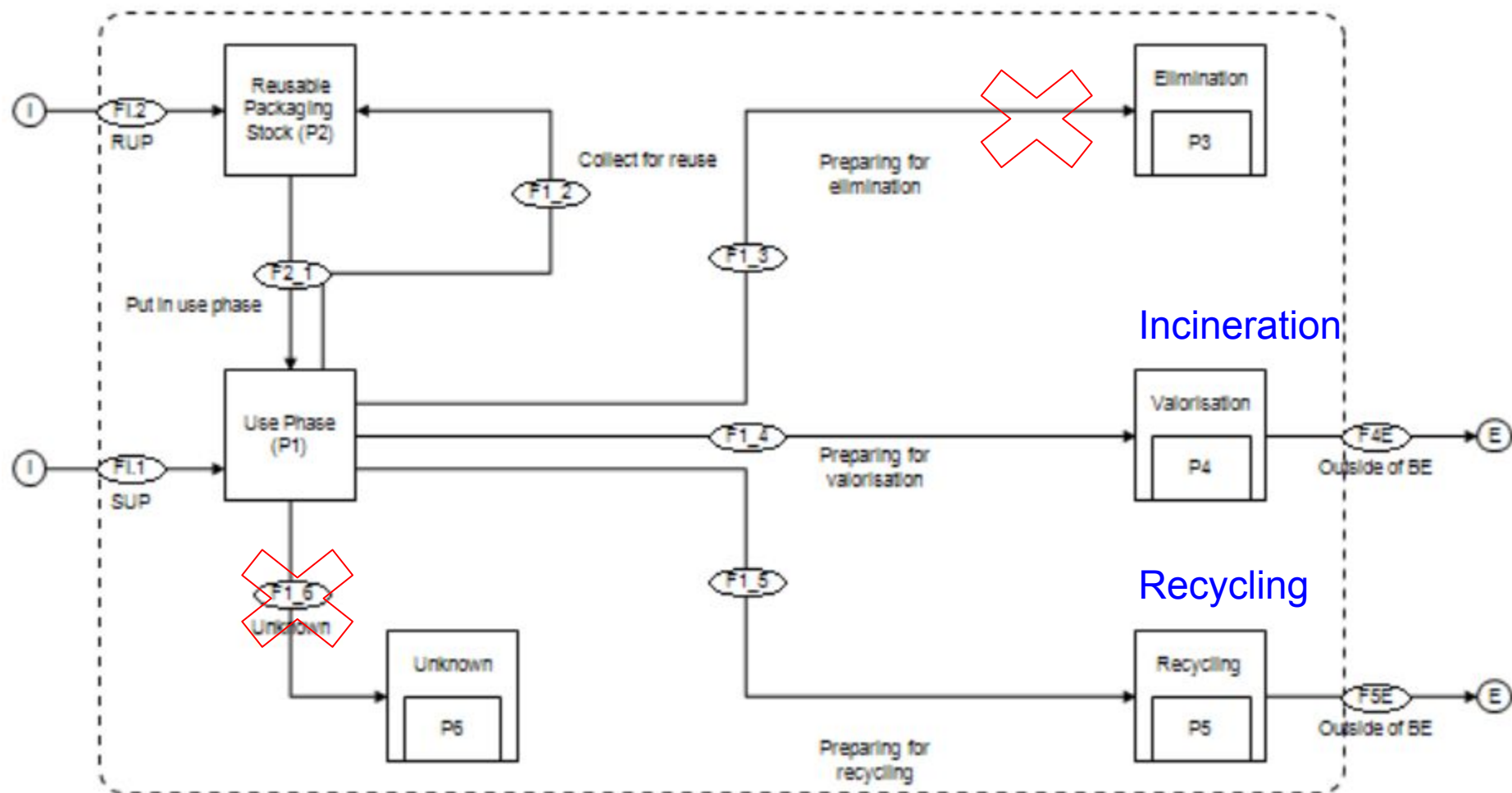
A horizontal bar chart showing a target of 55% for the year 2030. The bar is divided into a dark red segment representing 55% and a light red segment representing the remaining 45%.

Research Question

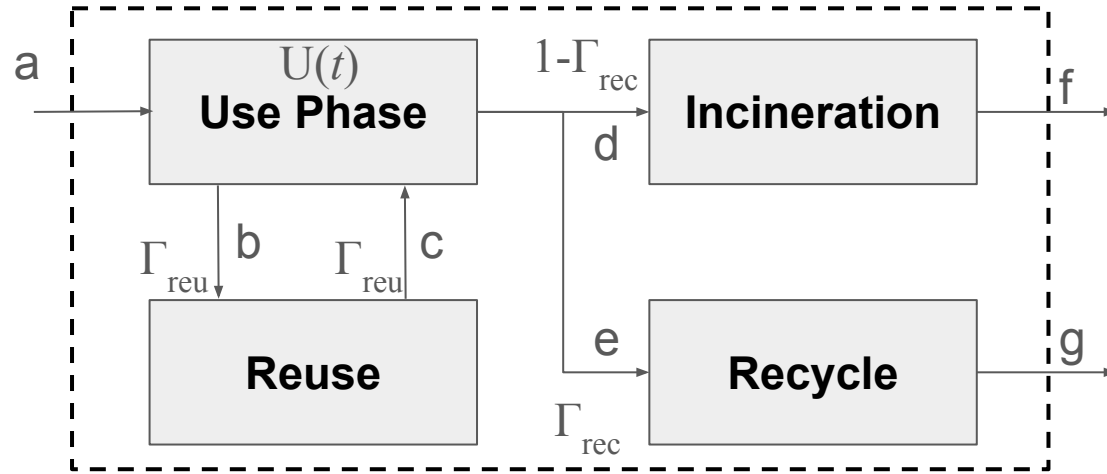
How does the climate impact respond if we successfully reach the reuse and recycling targets of industrial plastic packaging?







MFA diagram



$$a(t) = U(t) \cdot (1 - \Gamma_{reu}(t))$$

$$b(t) = c(t) = U(t) \cdot \Gamma_{reu}(t)$$

$$d(t) = f(t) = U(t) \cdot (1 - \Gamma_{reu}(t)) \cdot (1 - \Gamma_{rec}(t))$$

$$e(t) = g(t) = U(t) \cdot (1 - \Gamma_{reu}(t)) \cdot \Gamma_{rec}(t)$$

MFA

Methodology

Product Type: Foils and solid packaging (Trays/Crates/Boxes)

Material Type: HDPE and LDPE

Processes: Usage, incineration, reuse, and recycling

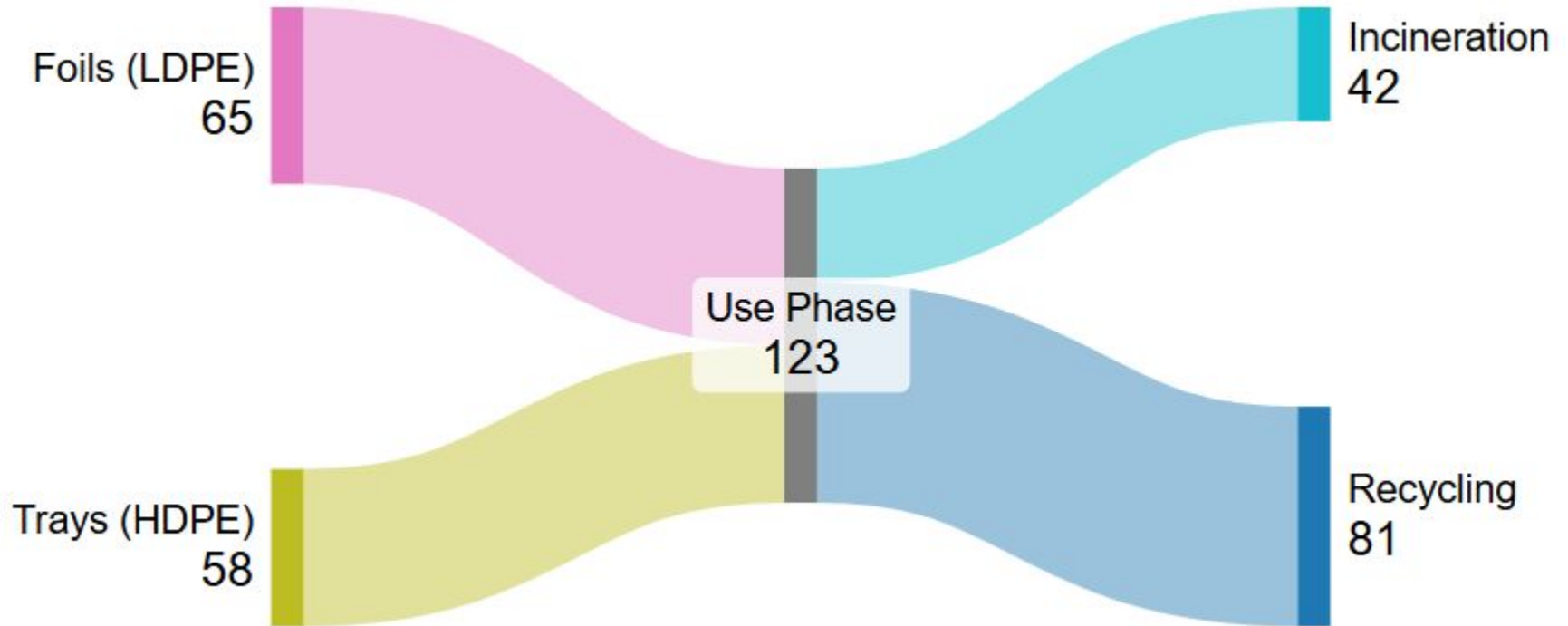
Geology: Belgium

Applied assumption

The consumption amount depends on the population and demand changes (Klotz et al., 2023):

$$Cons_{year} = cons_{2023} \times \frac{pop_{year}}{pop_{2023}} \times (1 - ei_y)^{year-2023} \times (1 + gr_{y,p})^{year-2023}$$

Industrial Plastic Packaging in Belgium in 2023 (kt)



Scenario analysis

Scenario 1

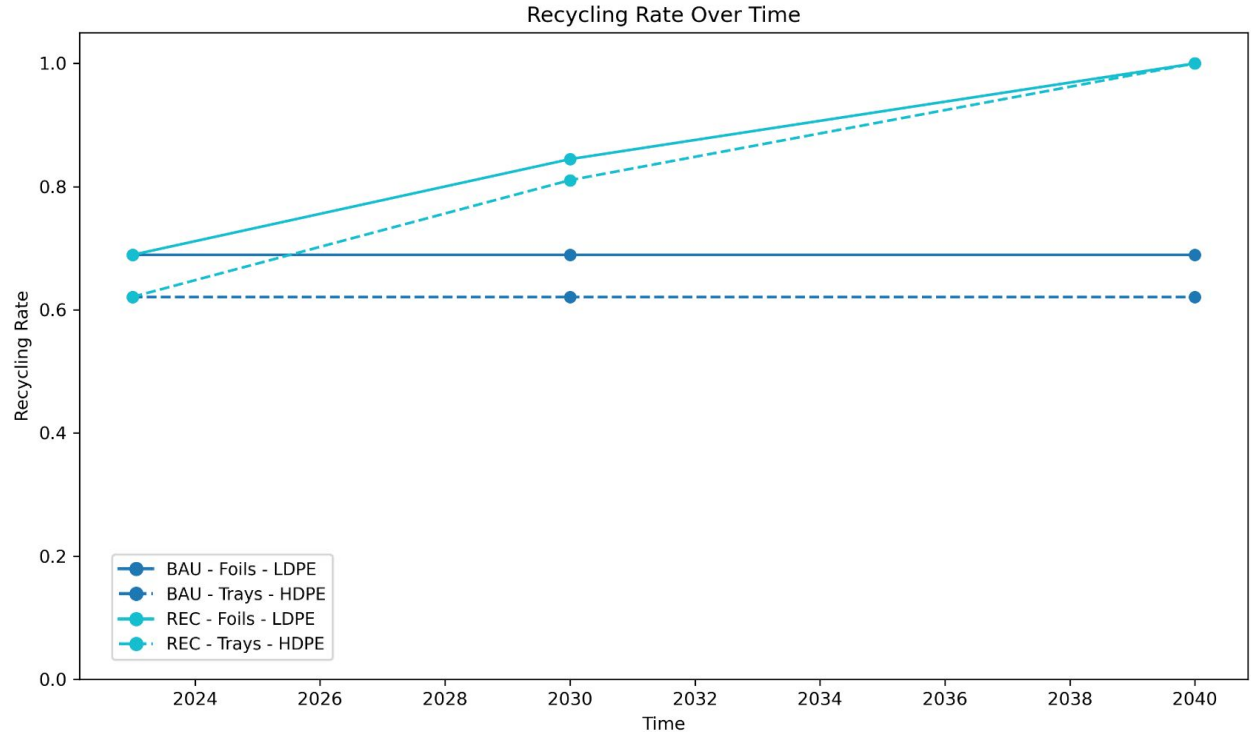
Recycling rate:
Business As Usual 2023

Scenario 2

Recycling rate

2030: 80%

2040: 100% (Foil/Trays)



LCA

Methodology

Product: Plastic use impact in Belgium (service)

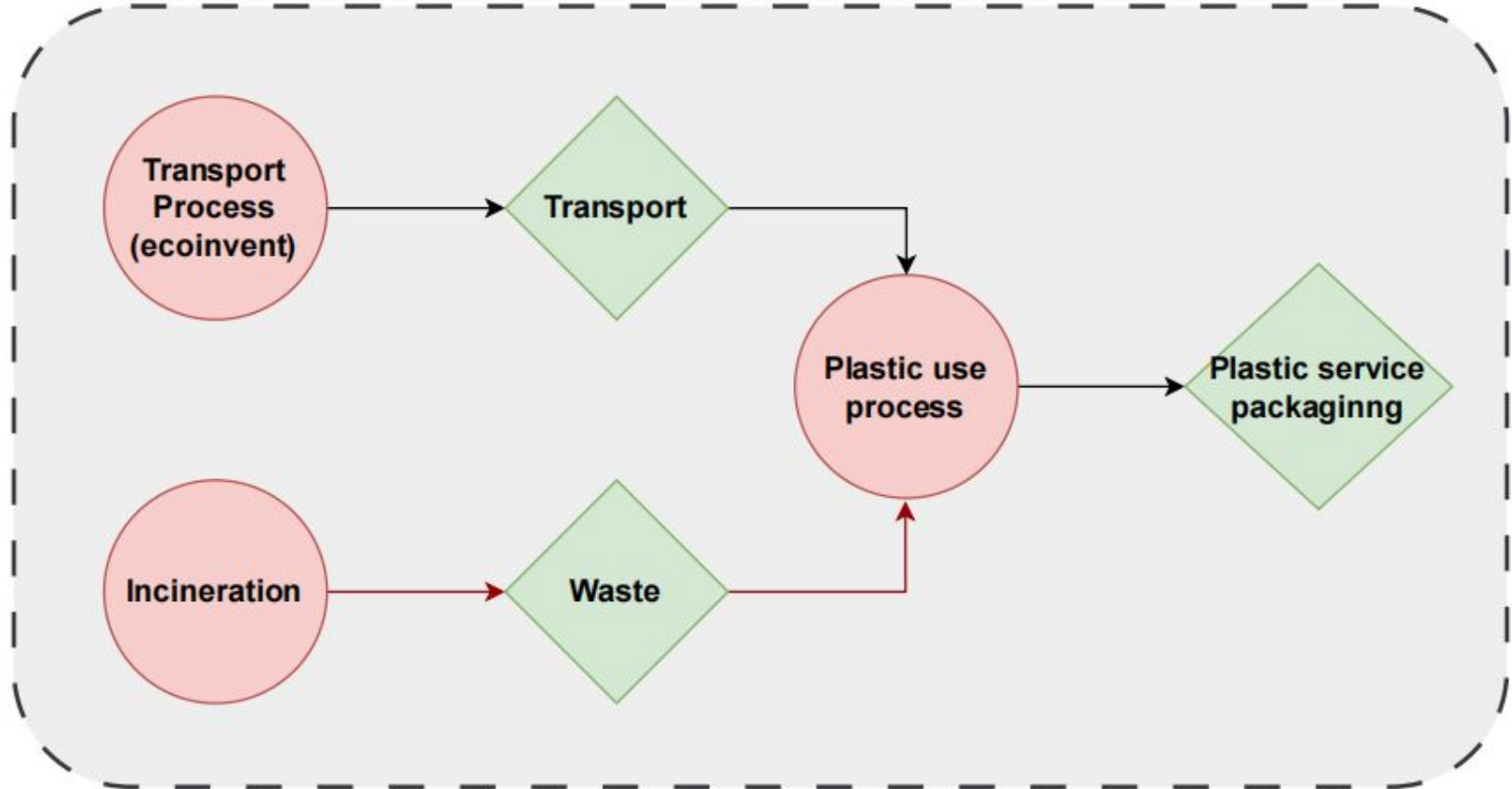
Processes: transportation, incineration

Impact method: IPCC 2021, Global warming potential (GWP 100)

Applied assumption

The distance from production to the usage site was set to 42 km.

LCA-diagram

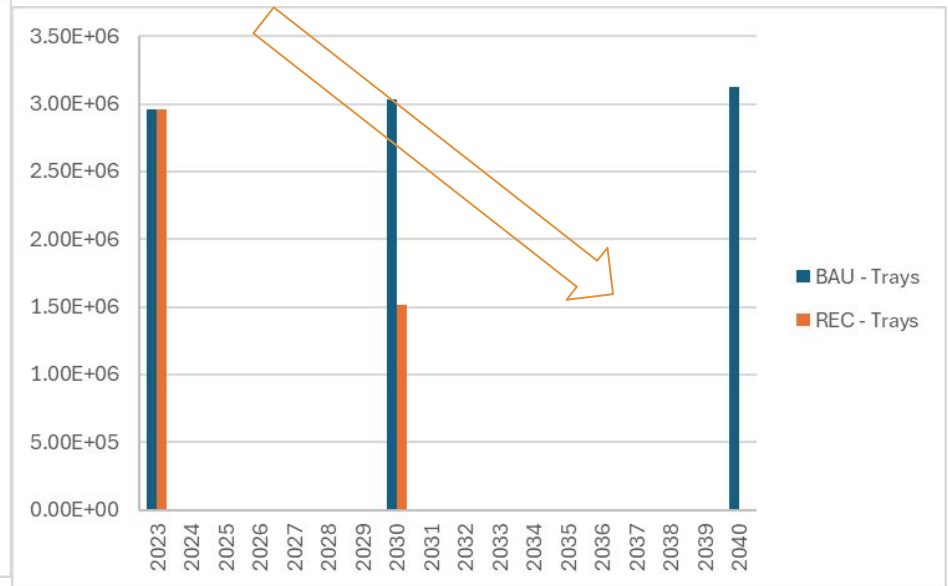
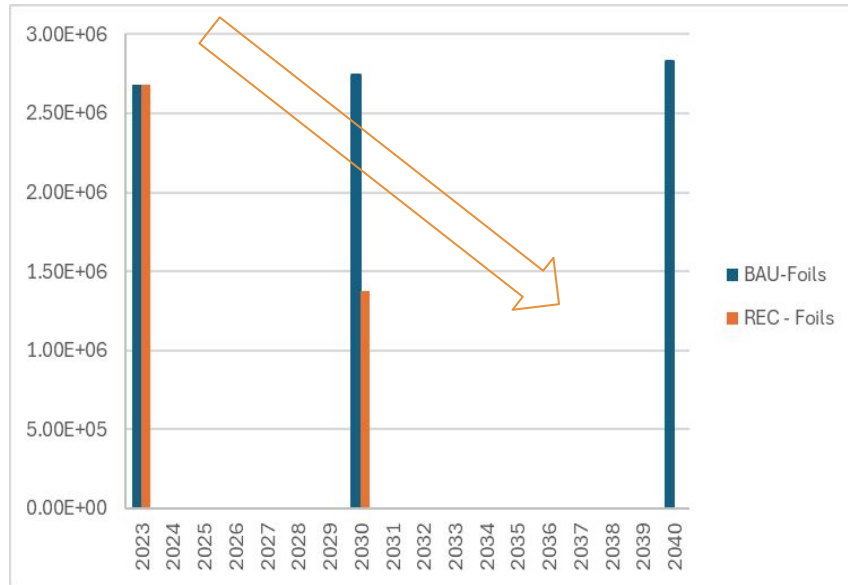


Results-LCA

Y axis: Global Warming Potential (g CO₂eq) for total HDPE plastic used in Belgium

X axis: Year from 2023 to 2040

Data: Recycling rate available at 2023 (BAU), 2030, and 2040



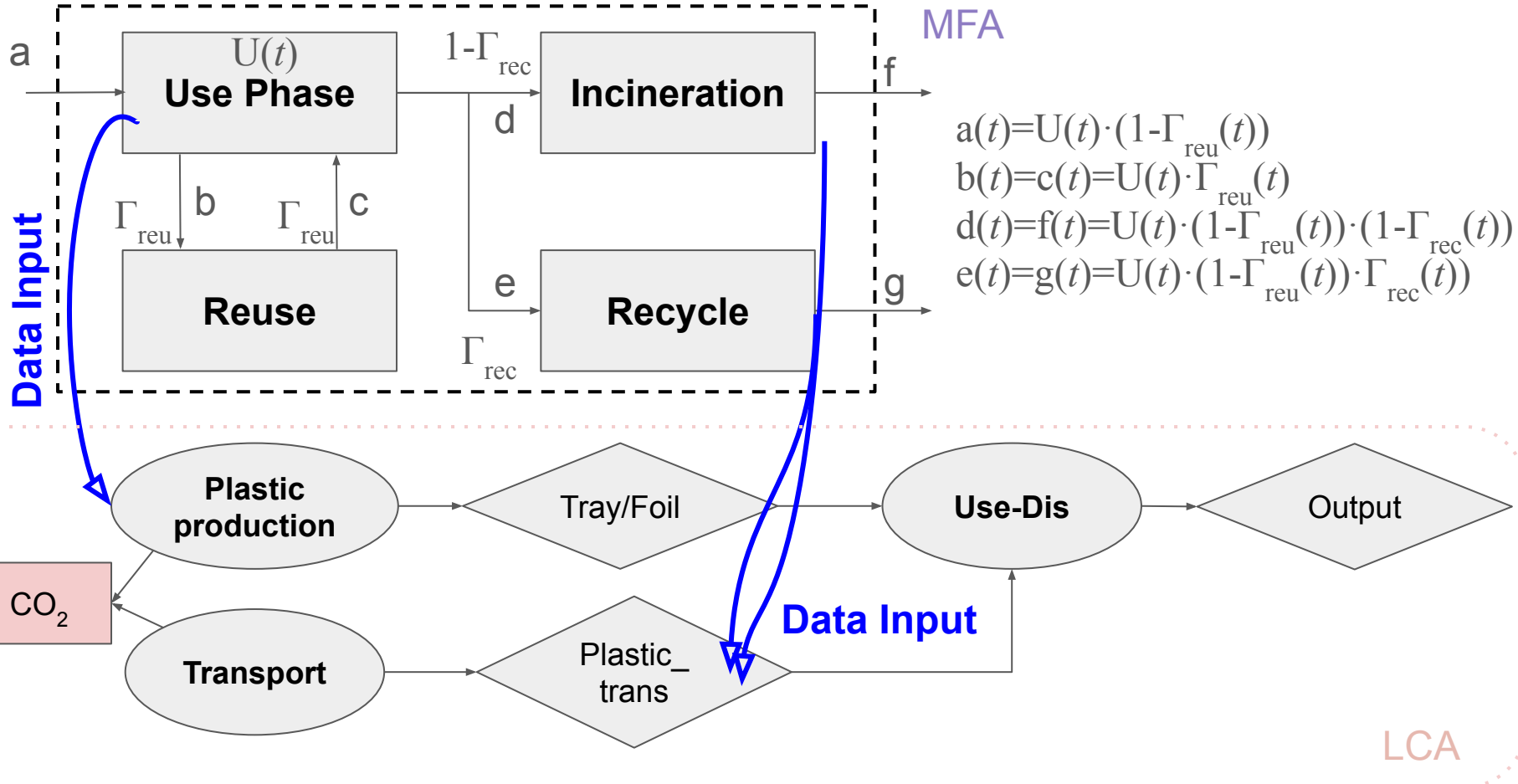
Summary

MFA: Used ODYM model for MFA of HDPE plastics in Belgium

BrightwayLCA: Used the Brightway packages, and ecoinvent database (created nodes and edges) and estimate the impacts (GWP) of plastics use

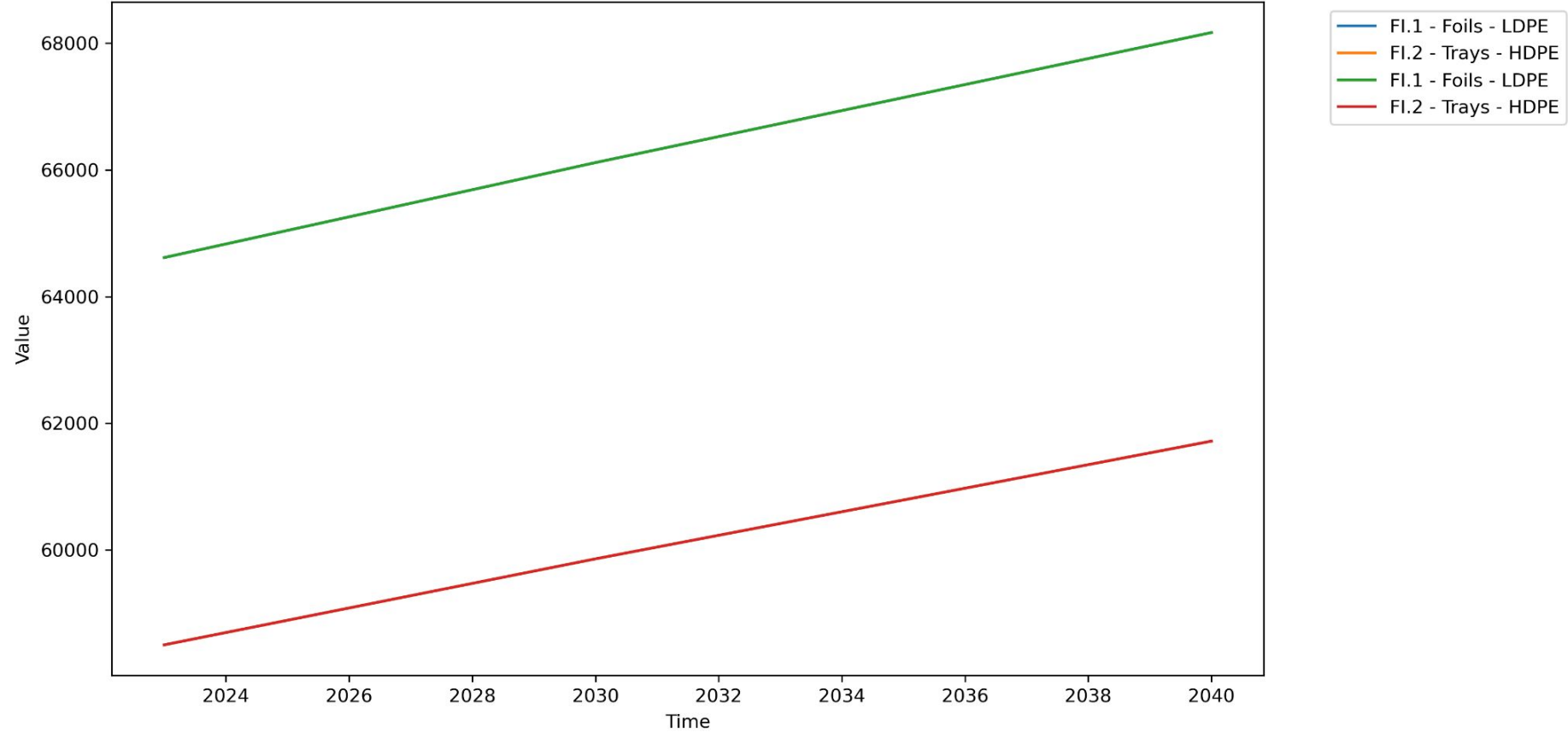
Integrated model: The material flow (HDPE from recycling) came from the MFA model and the impact came from the LCA model; 1 parameter model

MFA-LCA diagram



Results-MFA

Flows FI.1 and FI.2 over Time by Product and Polymer



Results-MFA

Flows FI.1 and FI.2 over Time by Product and Polymer

