Impacts of Circular Economy Transition – Modelling Results from TransCirc

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Boosting Circular Economy – Circular economy advancements from Finland and around the World

30.9.2021

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Why study circular economy transition?

Circular economy ‘win-win’ for EU climate and biodiversity goals

The Finnish presidency has urged member states and the next European Commission to develop the next phase of the EU’s circular economy strategy to help meet its climate and biodiversity targets

by Simon Pickstone

- Effects of CE transition?
- For example a win-win?
  - Which scale and scope?
  - With which measures?
  - On what conditions?

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CE transition research with economy-wide modelling

- The transition to a more circular economy involves structural shifts in the economy
  - Reallocation of capital and labor, “winners and losers”
  - Overall effect on GDP
- The need for capturing aggregate economic outcomes, indirect impacts or the essential dynamic nature of the transition

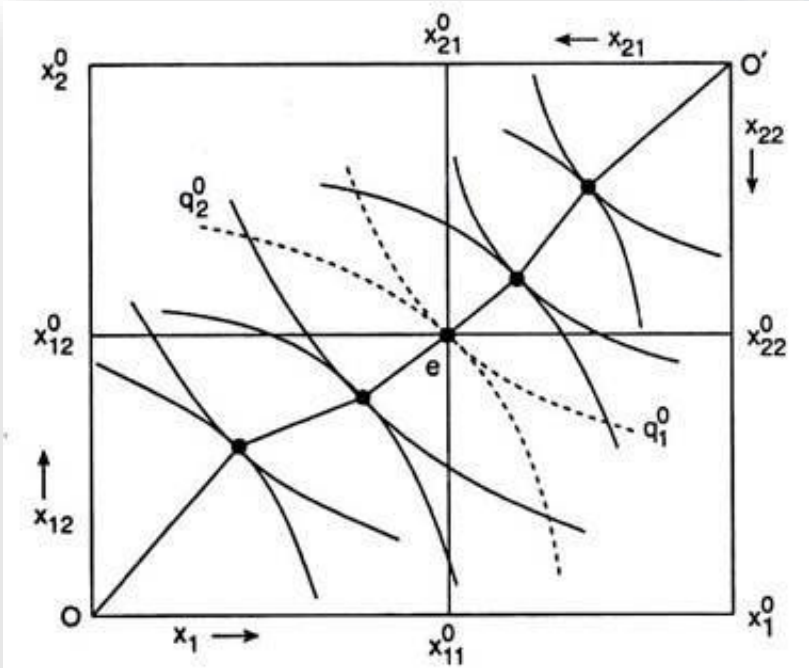

Fig. 21.6 Allocation of resources in general equilibrium

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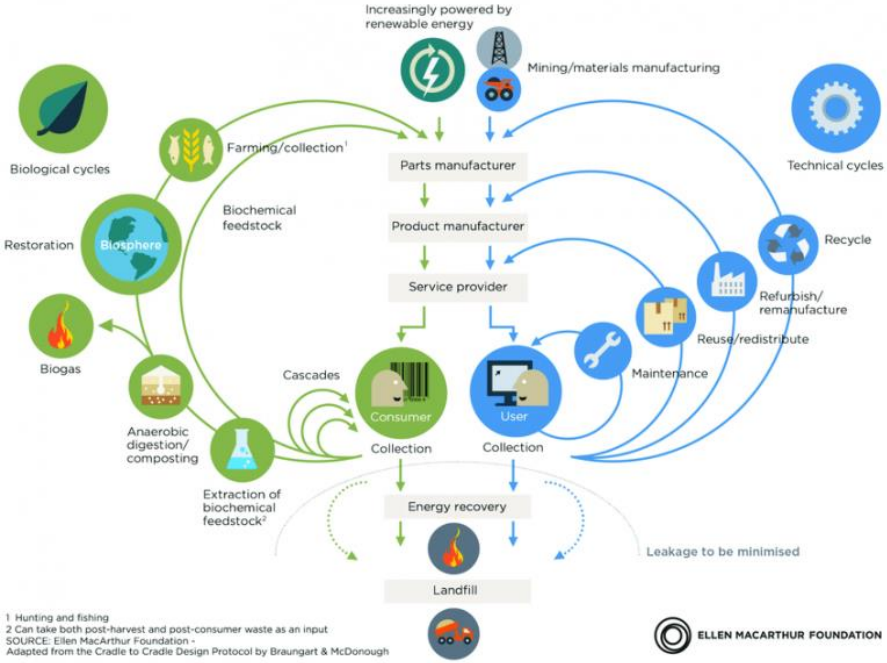
What is a model?

- A model is
  - An indirect method of inquiry
  - A surrogate object about its target (Mäki 2018)
- A model, not THE model (Rodrik 2015)
- Every model possesses strengths and weaknesses
- Every model includes assumptions



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Possibilities of modelling

- An economic model can capture
  - Interdependencies
  - Rebound effect
  - Behavior of economic agents
  - Price mechanism
- Evaluation of policy steering, actions, strategies etc. beforehand (ex ante), scenario analysis (what-if)
- Different scopes: industries, consumption, national economy
- Comparability

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Pitfalls of modelling

- Too aggregated for analysis of a detailed product or action
- Availability of (price) data?
- Not easy to duplicate
- Idealizations and (unrealistic critical) assumptions
- Large systemic changes difficult to model with existing structure
- Failed selection of model (e.g. static model in dynamic research task)
- Models illuminate only a fraction of reality; what is excluded?
  - Casting light = casting shadows (Mäki 2018)
- Insufficient model commentary, failed communication with “the audience”

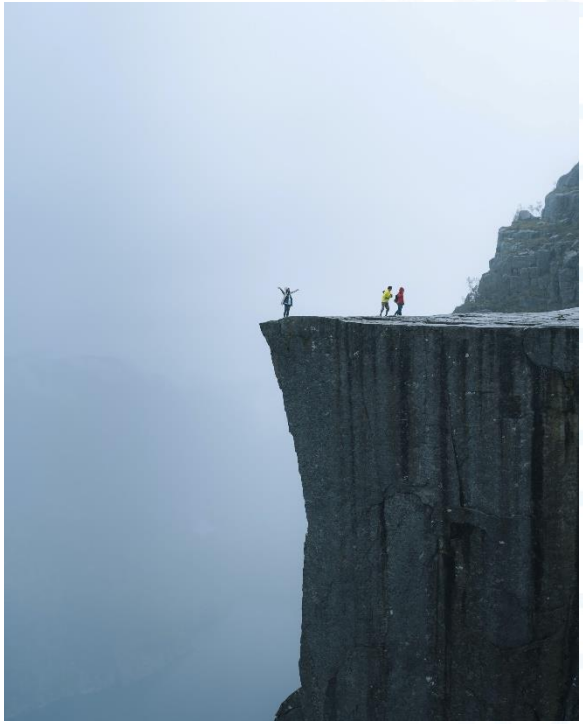

Photo by Valdemaras D. on Unsplash

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Transition Pathways Towards Circular Economy (TRANSCIRC) research project

- 2017–2021, funded by The Academy of Finland
- Main goals
  - to identify the current challenges in implementing a circular economy
  - to design concrete pathways that consist of different future-oriented CE actions to meet set targets
  - To analyse the impacts of the pathways
- Main tools: environmentally-extended economy-wide models
- Two examples of our approaches / studies

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TRANSCIRC

Analysis of the current state of Finnish economy

- Which industries are the most important, when we try to cut GHG emissions with CE actions
- Environmentally-Extended Input-Output model *ENVIMAT*, data year 2015
- Comparison of industries
  - Life Cycle GHG emissions (total)
  - Raw Material Requirement (total)
  - Value added (direct)
- Analysis of production chain (structural path analysis)

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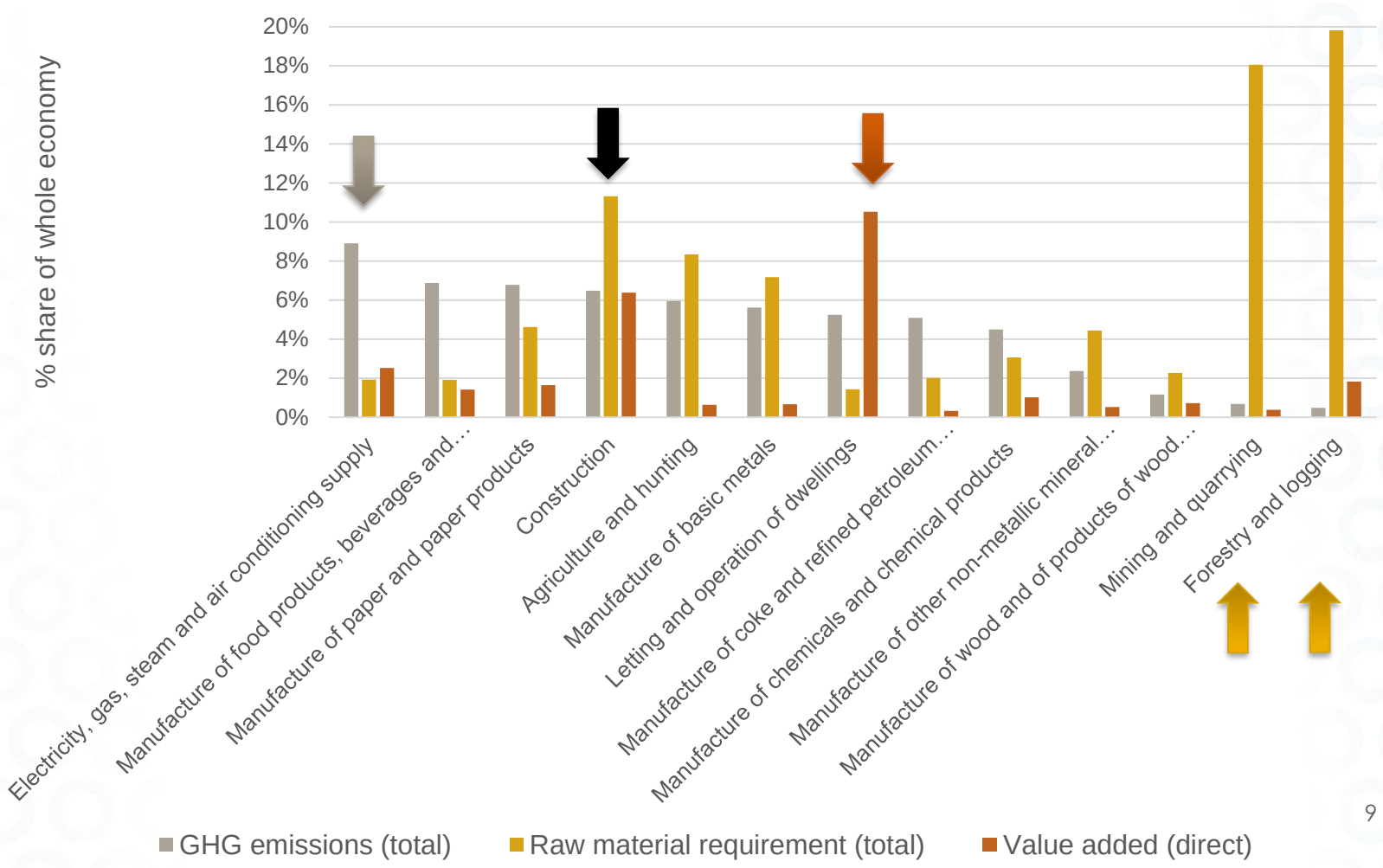

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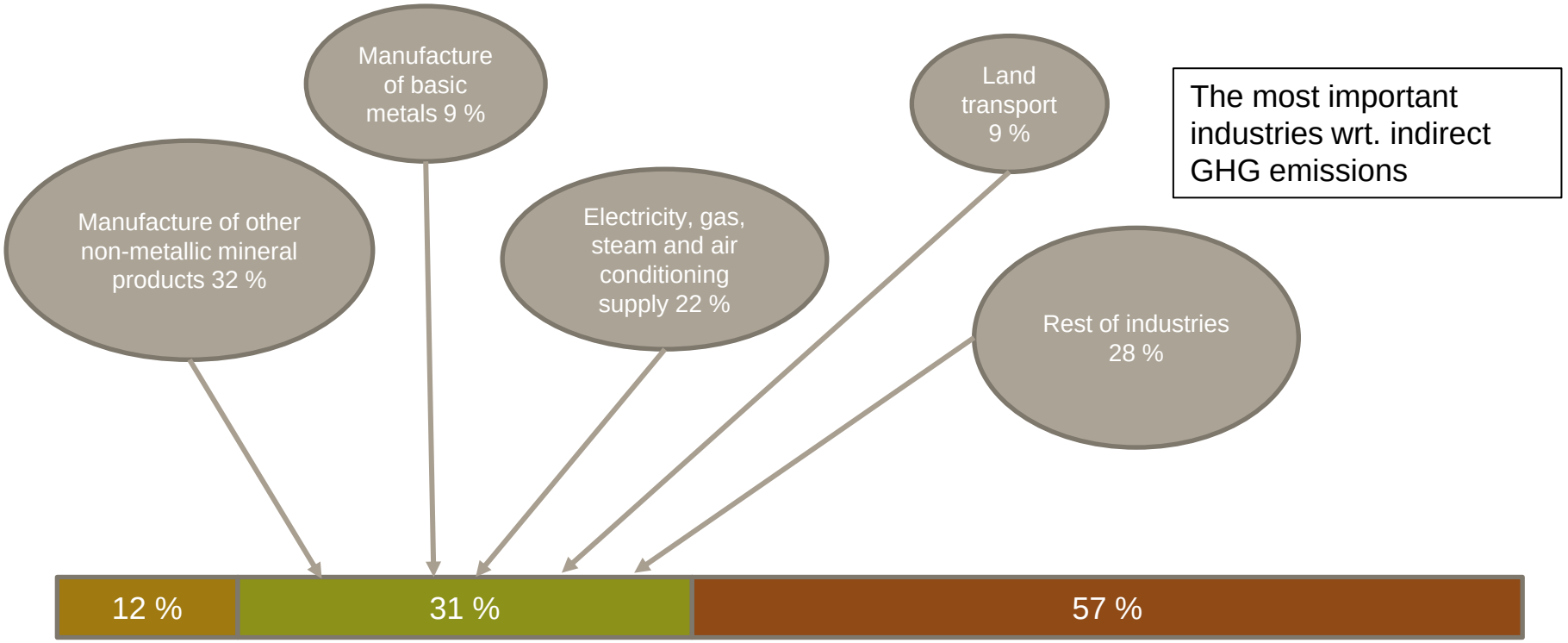
Nissinen & Savolainen 2019

Construction: Life Cycle GHG Emissions in Finland 12,5 Mt CO_2e (2015)



Ruokamo et al. 2019

Scenario analysis: Increasing recycling and secondary manufacturing of plastics

- What are possible economic and raw material use effects of increasing plastics recycling to meet recycling targets?
- Environmentally-Extended Dynamic Computable General Equilibrium model *FINAGE*
- Comparison of three scenarios
  - Sce1: Factory investments, increased collection, secondary plastics output, changed input factor use in waste management
  - Sce2: Sce1 + tax on incineration
  - Sce3: Sce2 + tax subsidy to domestic plastic products
- Effects on GDP and raw material use at national economy level in Finland

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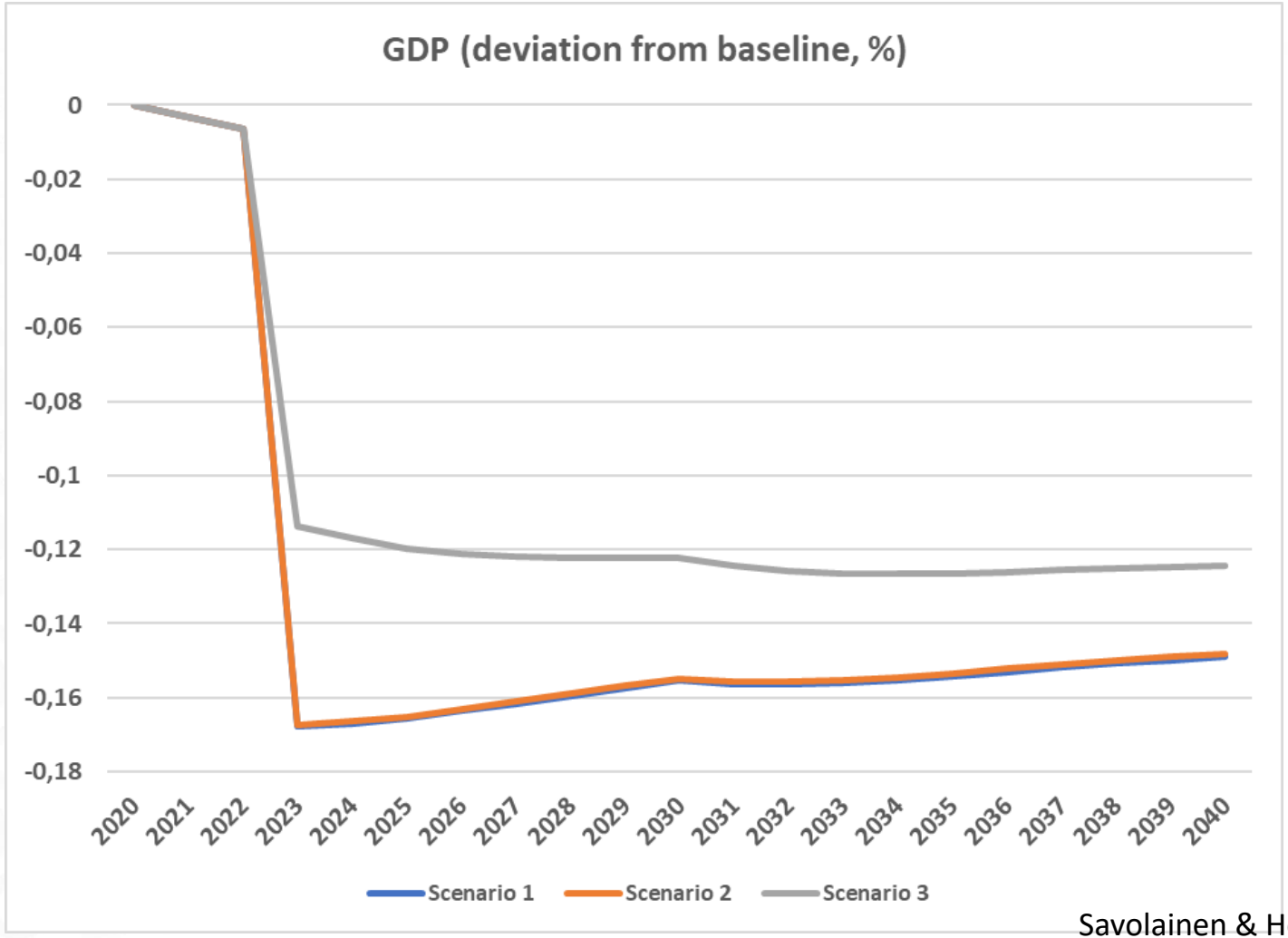

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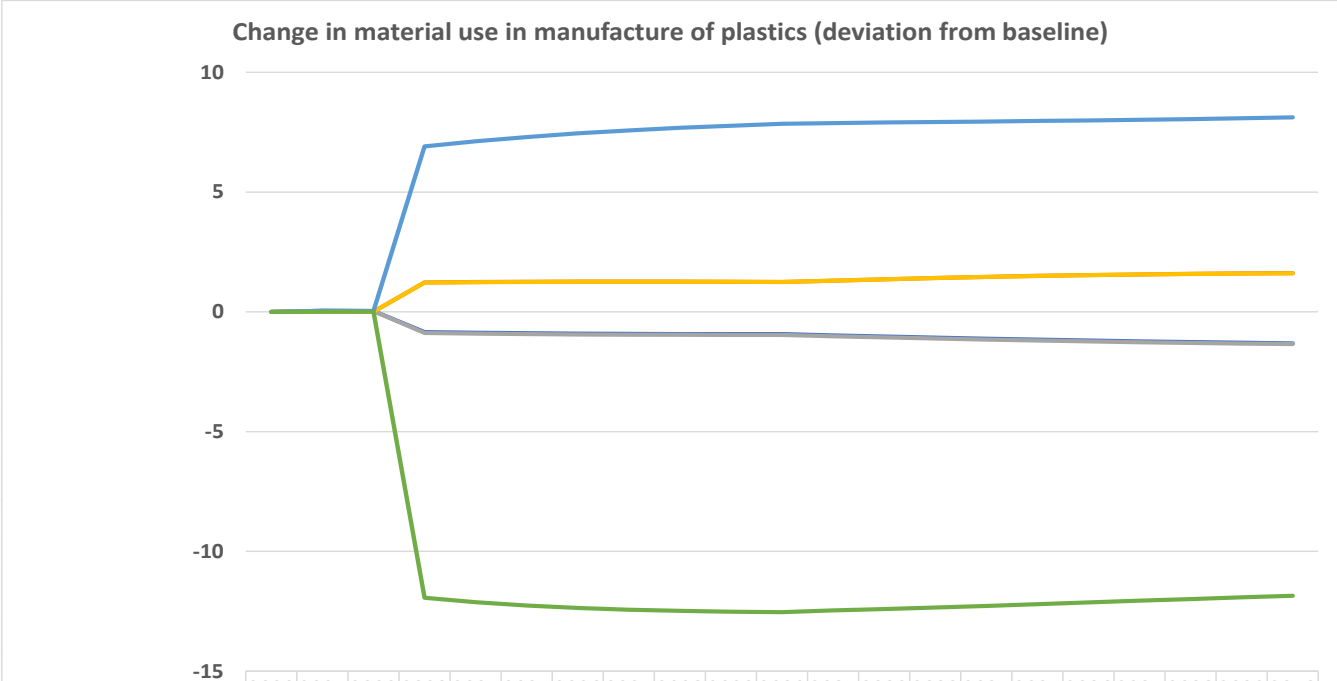
Savolainen & Honkatukia 2021

Impacts on material flows

Savolainen & Honkatukia 2021



	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Scenario 1 DOM	0	0,04	0,04	-0,8	-0,9	-0,9	-0,9	-0,9	-0,9	-0,9	-0,9	-1	-1	-1,1	-1,1	-1,2	-1,2	-1,2	-1,3	-1,3	-1,3
Scenario 1 IMP	0	0,01	0,01	1,22	1,24	1,26	1,26	1,27	1,26	1,26	1,25	1,3	1,36	1,41	1,46	1,5	1,54	1,56	1,59	1,6	1,61
Scenario 2 DOM	0	0,04	0,04	-0,9	-0,9	-0,9	-0,9	-1	-1	-1	-1	-1	-1,1	-1,1	-1,2	-1,2	-1,2	-1,3	-1,3	-1,3	-1,3
Scenario 2 IMP	0	0,01	0,01	1,21	1,23	1,25	1,26	1,26	1,26	1,25	1,24	1,3	1,36	1,41	1,46	1,5	1,53	1,56	1,58	1,6	1,61
Scenario 3 DOM	0	0,04	0,04	6,91	7,12	7,29	7,45	7,58	7,68	7,77	7,85	7,88	7,9	7,92	7,95	7,97	7,99	8,02	8,05	8,08	8,12
Scenario 3 IMP	0	0,01	0,01	-12	-12	-12	-12	-12	-12	-13	-13	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12

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Conclusions

- Models can be useful in evaluating policies ex ante (indirect effects, costs and benefits at economy-wide level)
  - Aggregate results
  - Winners-losers
  - Economy-environment trade-offs or win-wins
- Choose a model according to the task
- Several strengths in analyzing circular economy
- Try to avoid pitfalls!

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Thank You! Questions?

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