TREASoURcE

Applying system dynamics sustainability assessments (SDSA) to assess circular economy solutions in cities and regions

Alexander Koch, GreenDelta

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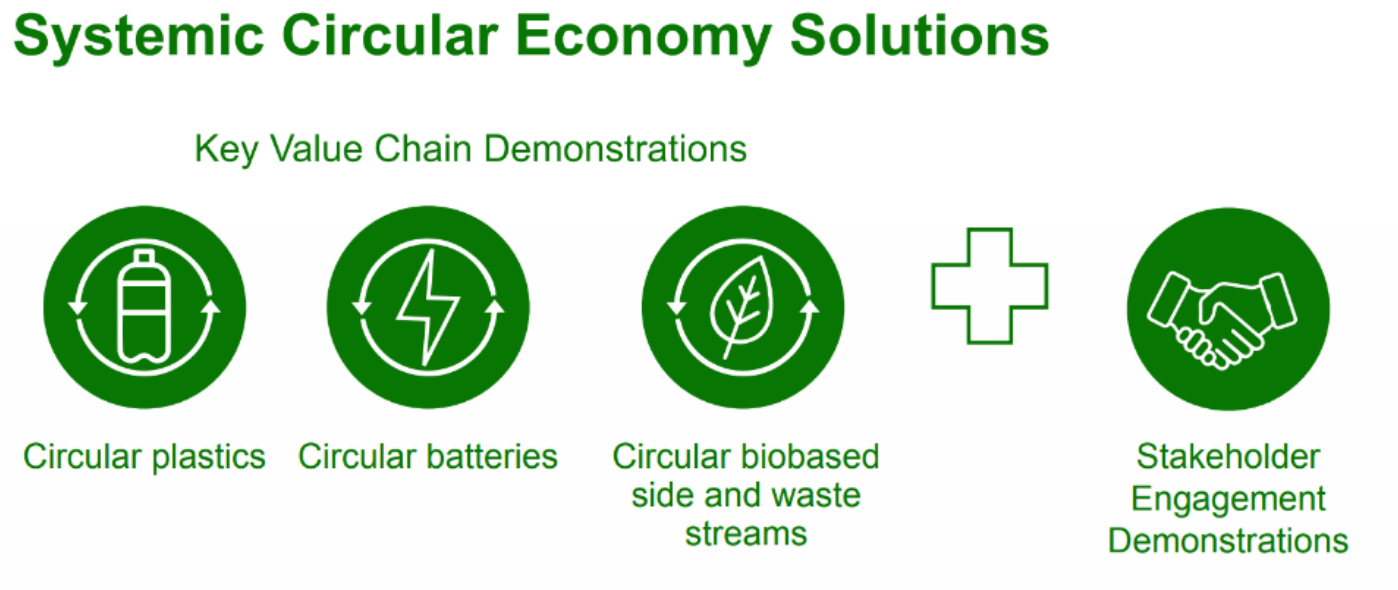
Motivation



- The TREASoURcE project is demonstrating and replicating circular economy solutions for 3 key value chains (plastics, batteries, biomass) in selected regions and municipalities
- A context-based sustainability assessment approach is needed
- This will allow localized decision-making for sustainable solutions

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Sustainability Assessment Framework

TREASoURcE

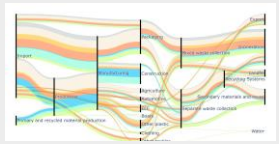
Goal
Describes the reason for carrying out the study

Scope

- Types of materials and products
- Value chain system boundaries
- Regional boundaries
- Timeframe
- Indicator types and metrics
- Data requirements
- Model structure
- Scenarios / Strategies

Data collection

- Primary and secondary data collection
- Data collection with (dynamic) MFA

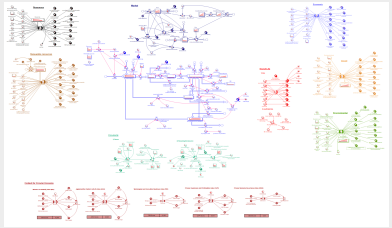


- Data generation with (prospective) LCSA

openLCA

Results calculation

- System dynamics



- Validation
- Classification

Interpretation

- Key observations
- Results analysis
- Sensitivity analysis
- Trade-offs
- Strategy recommendations

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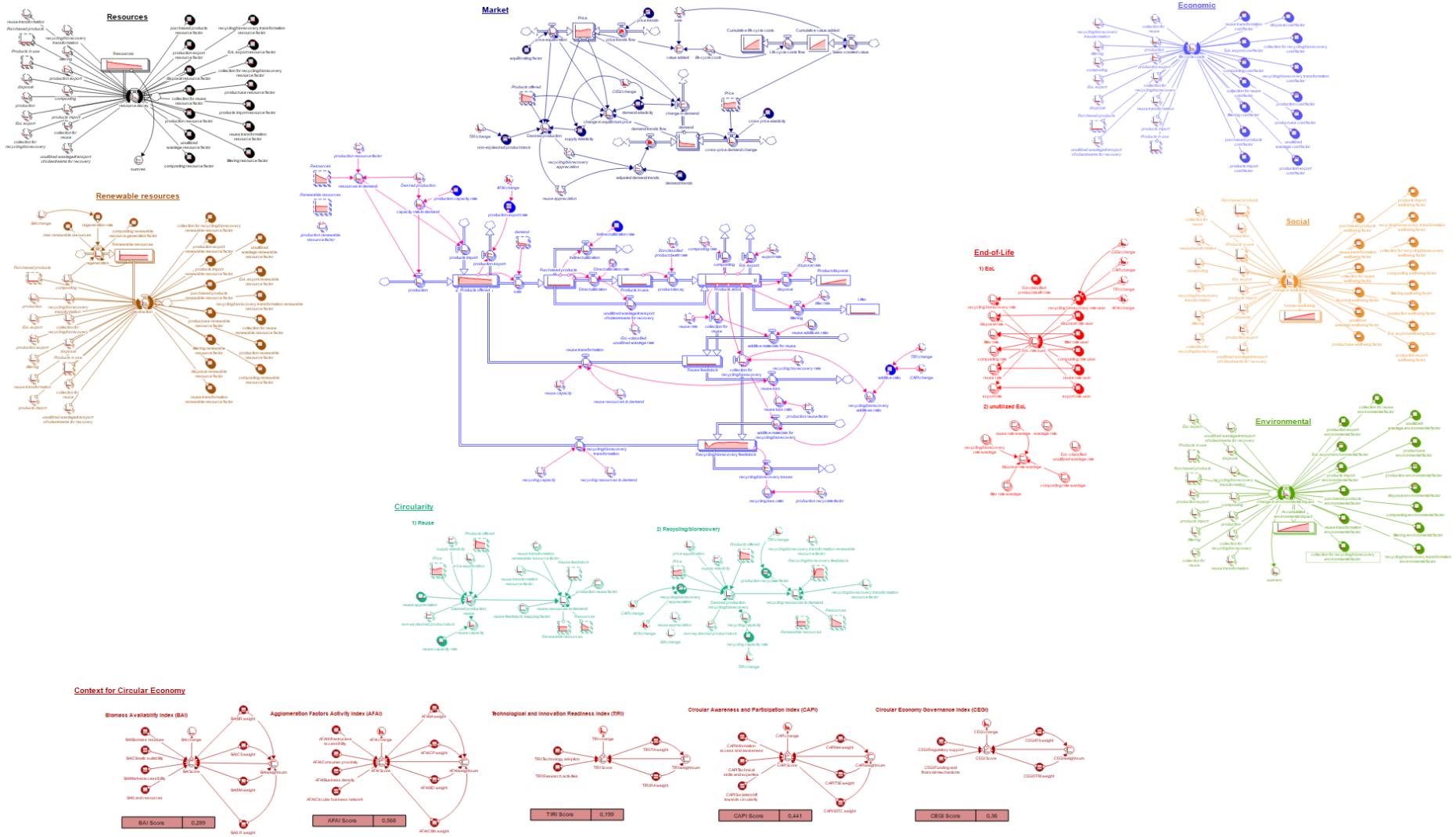
System Dynamics



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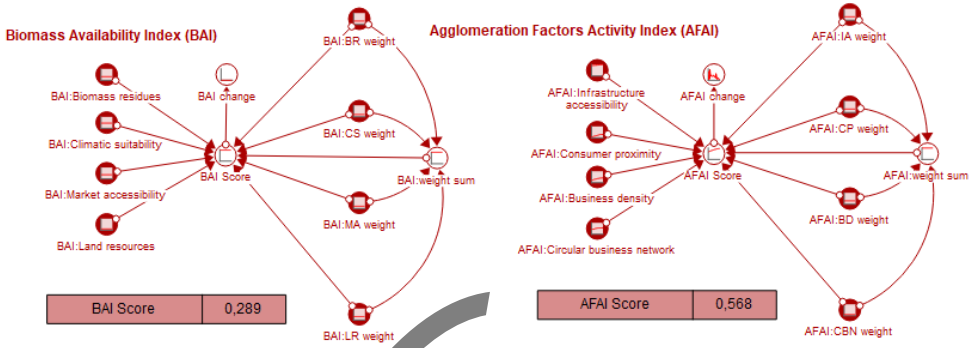
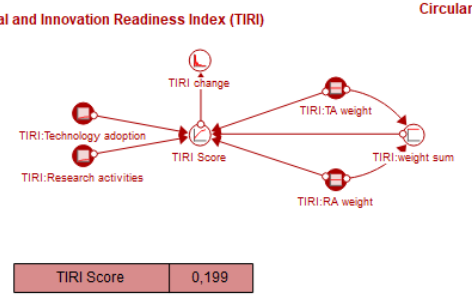
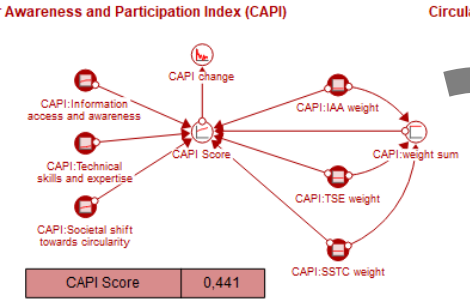
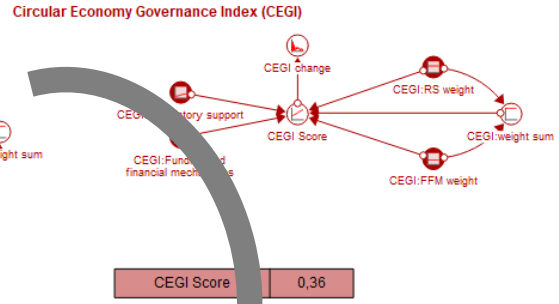
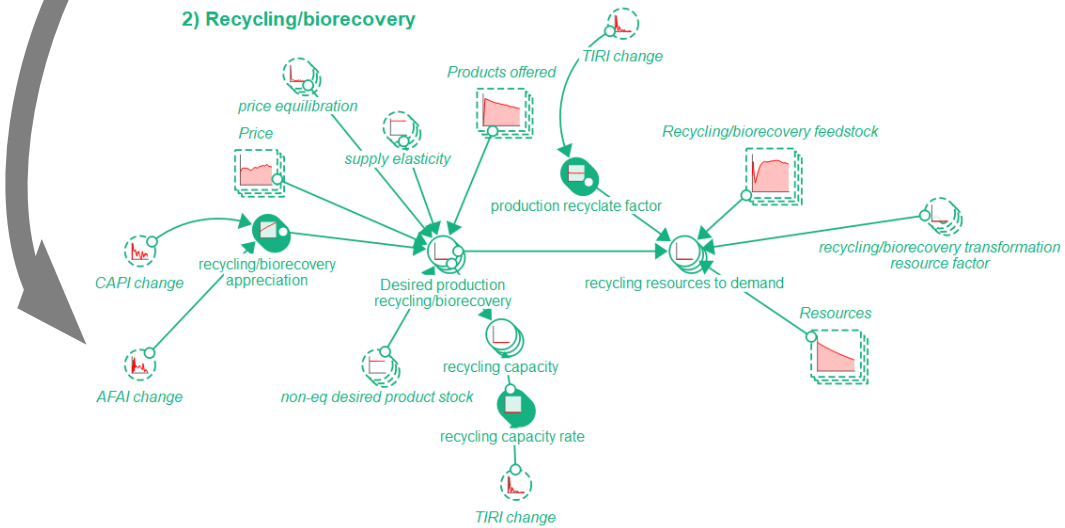
Context Indicators & Metrics

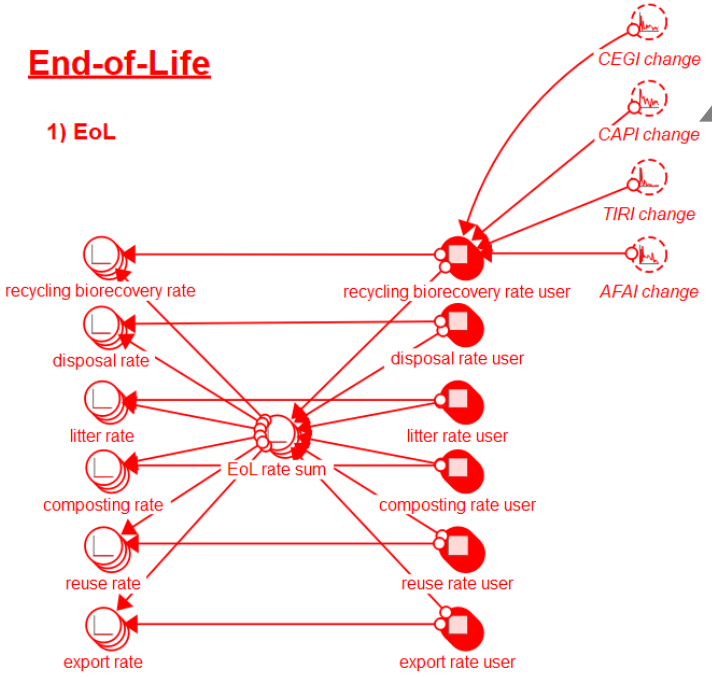












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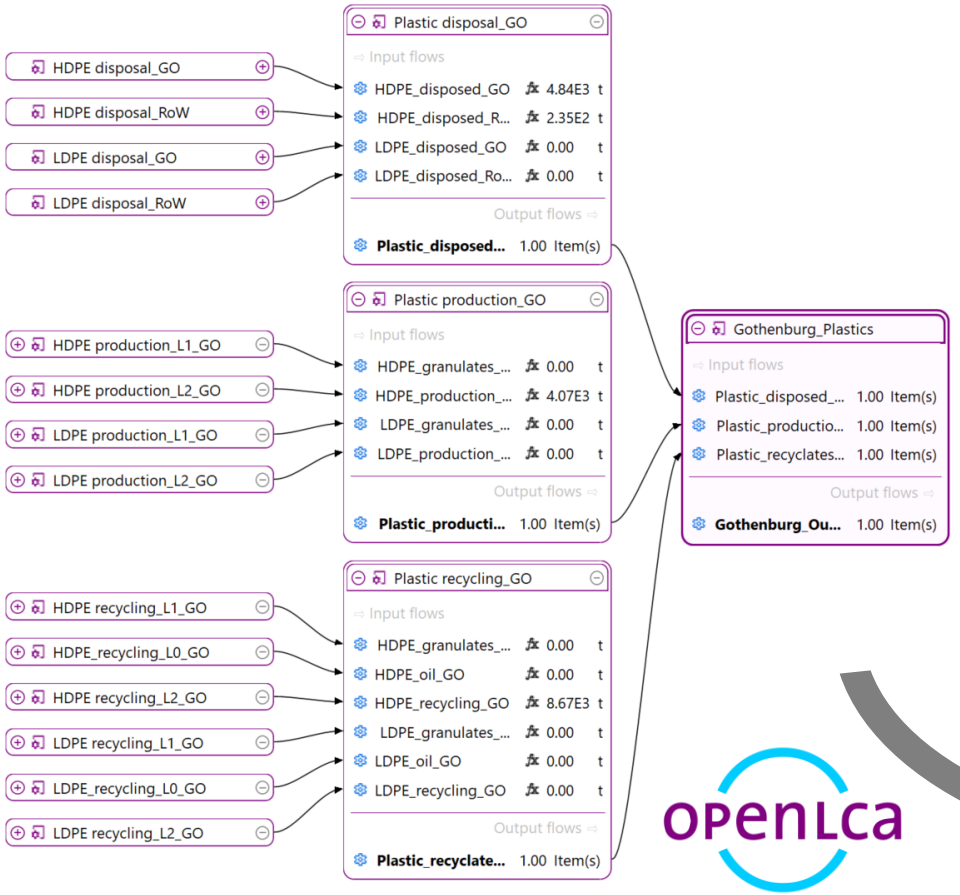
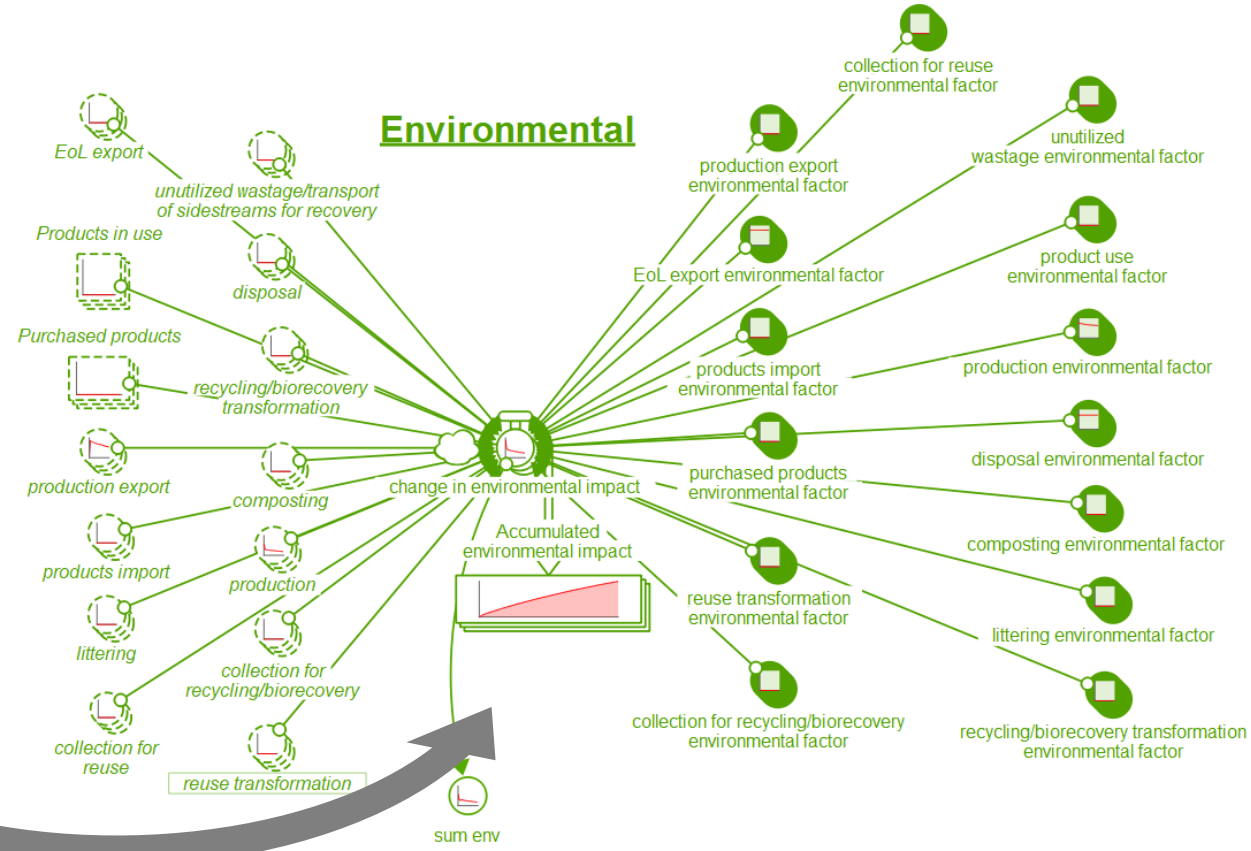
Mainly derived from Tapia et al. (2021): Towards a territorial definition of a circular economy: exploring the role of territorial factors in closed-loop systems, European Planning Studies

Prospective LCA





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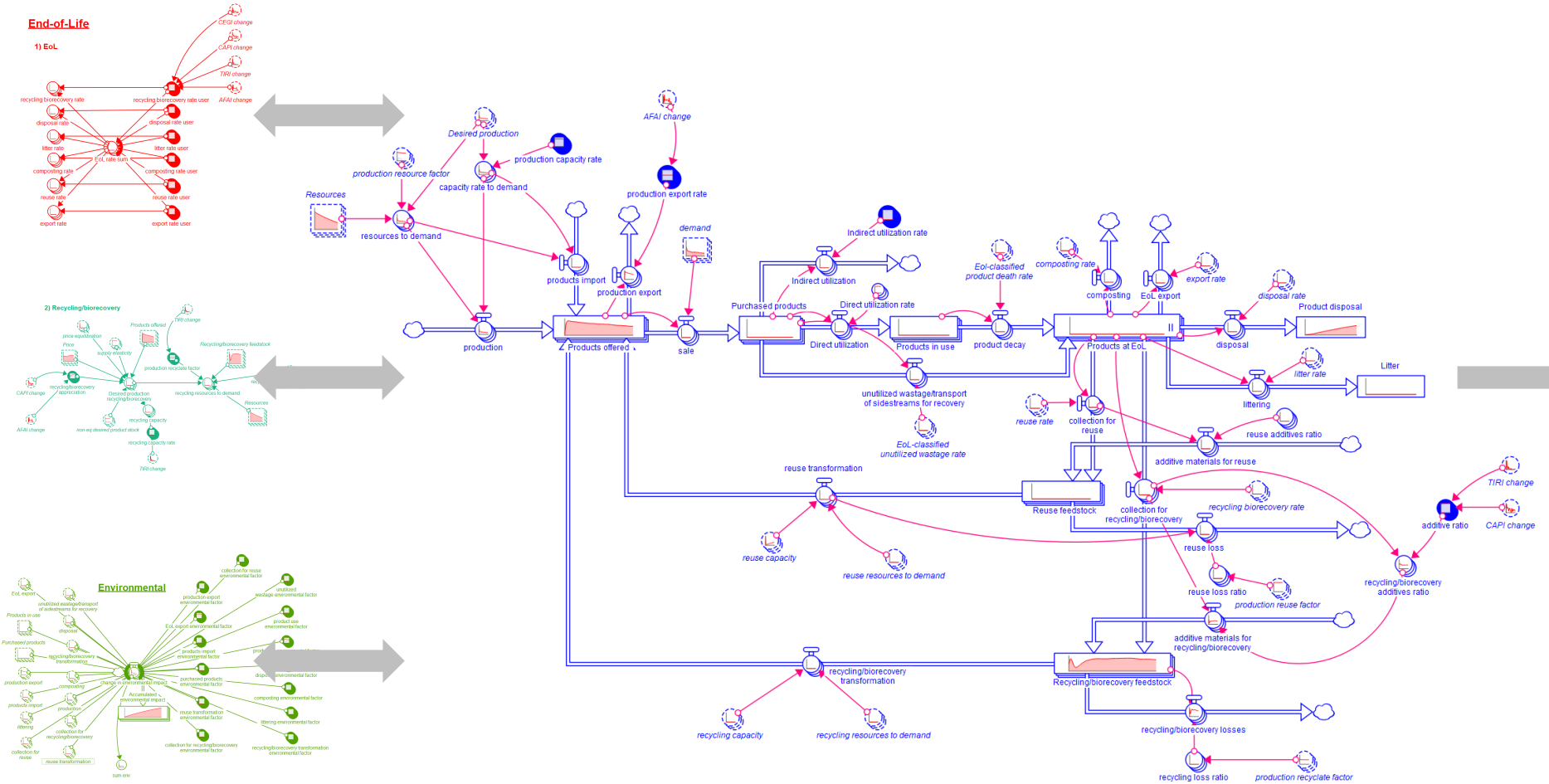
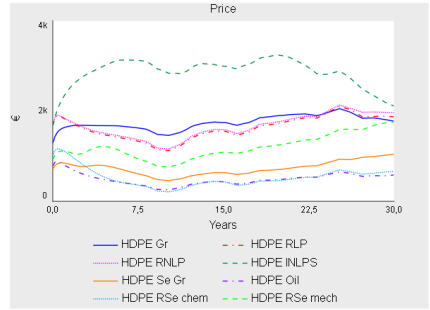
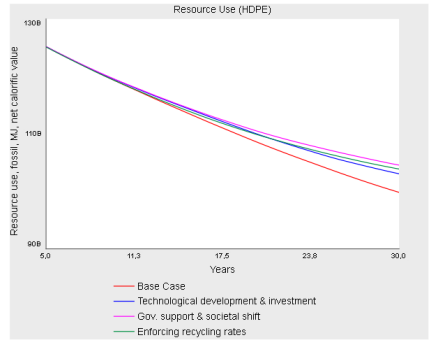
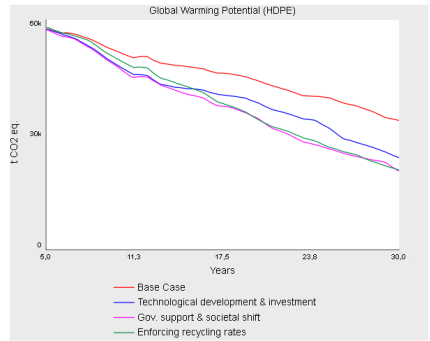
SDSA – System Dynamics Sustainability Assessments









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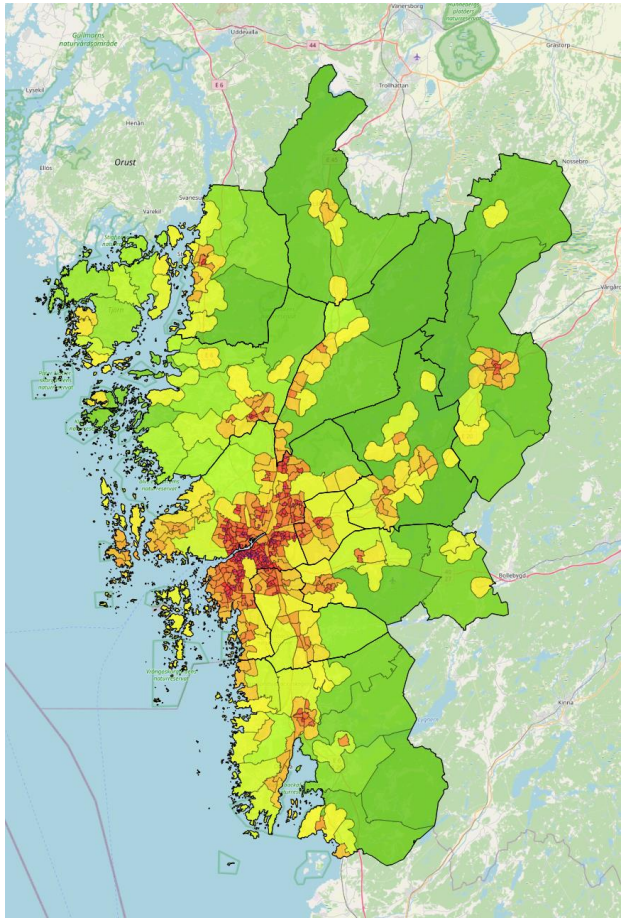
Case Study – Plastic Recycling in Gothenburg



- Project partners plan to demonstrate chemical recycling in Gothenburg, Sweden
- Is this suitable from a sustainability perspective?
- Looking mainly at polymers used for packaging
- Data allocation approaches defined where data was missing

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https://www.citypopulation.de/en/sweden/metrogoteborg/

Results – Context Indicator Scores

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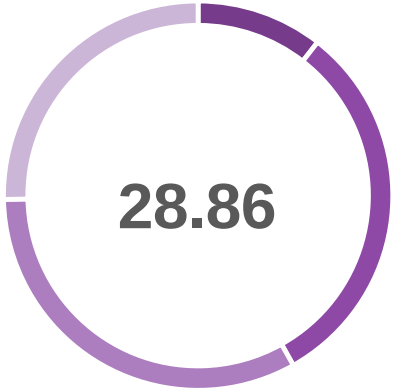
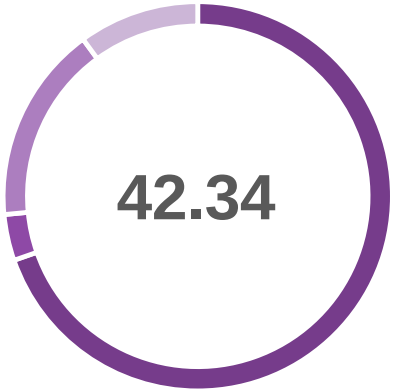
Biomass Availability Index



- Land resources
- Climatic suitability
- Biomass residues
- Market accessibility

Agglomeration Index

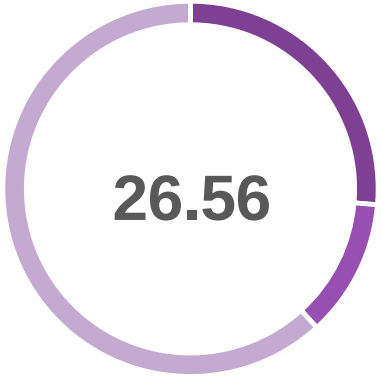


- Infrastructure accessiblity
- Consumer proximity
- Business density
- Circular business network

Technology Index

- Technology adoption
- Research activities

Circular Participation Index



- Information access and awareness
- Technical skills and expertise
- Societal shift towards circularity

Governance Index

- Regulatory support
- Funding and financial mechanisms

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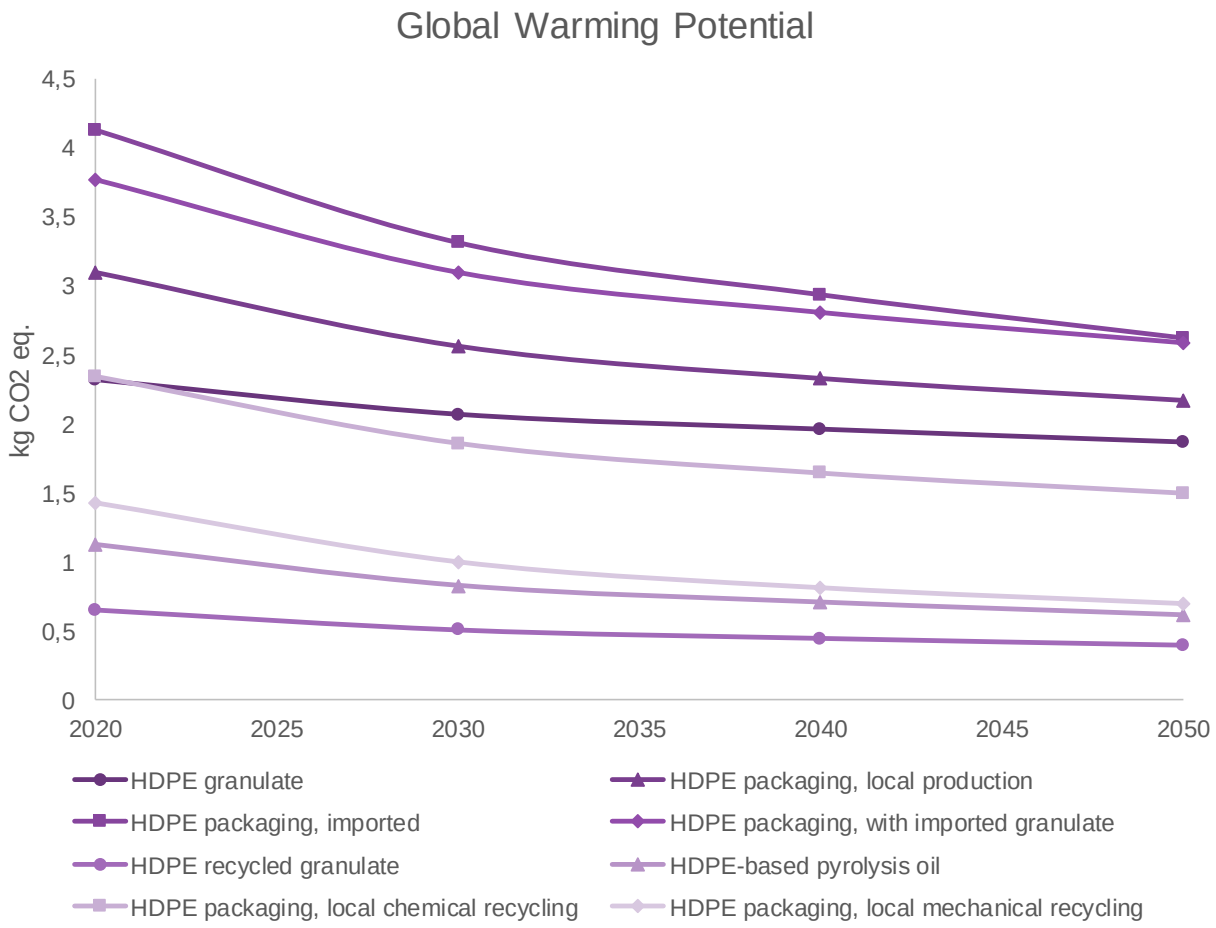
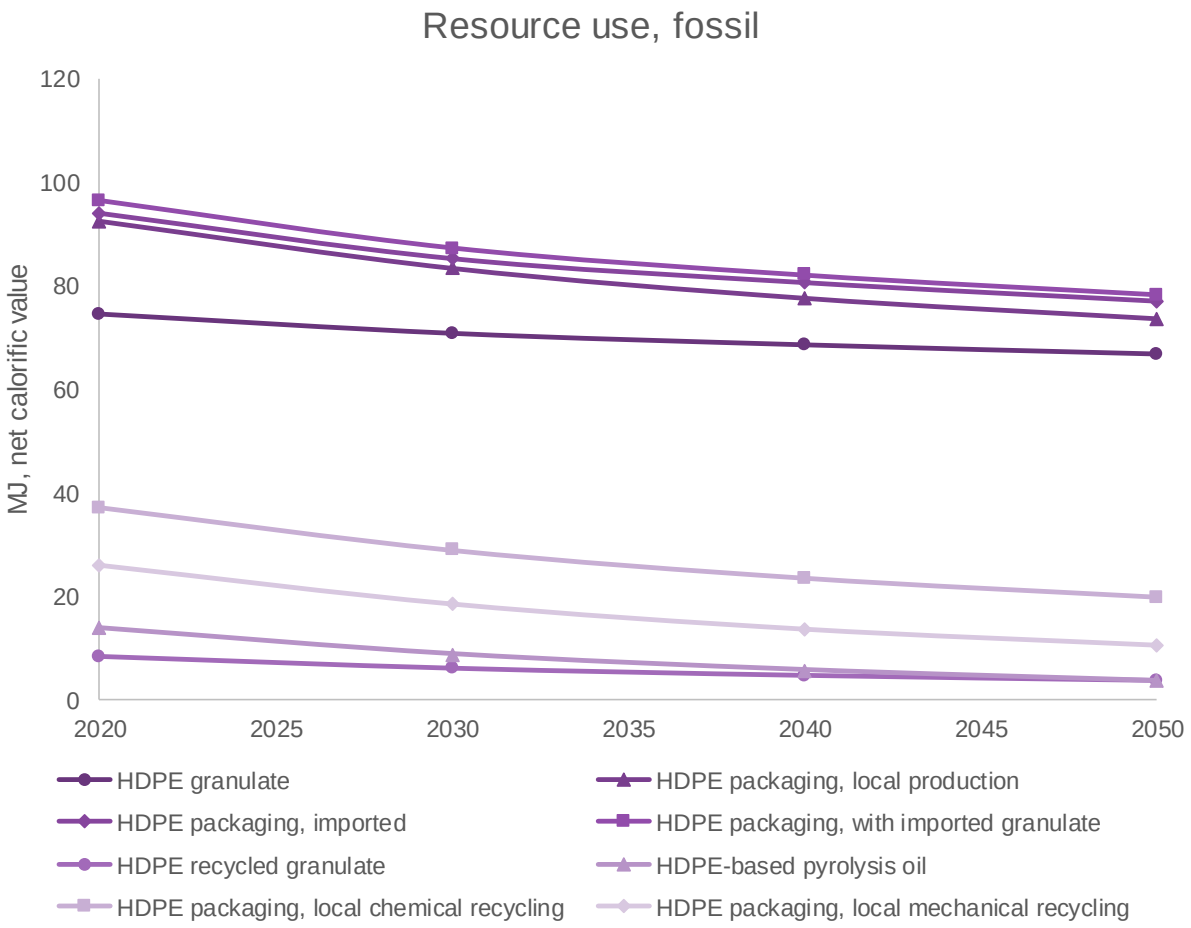
Results – Prospective LCA





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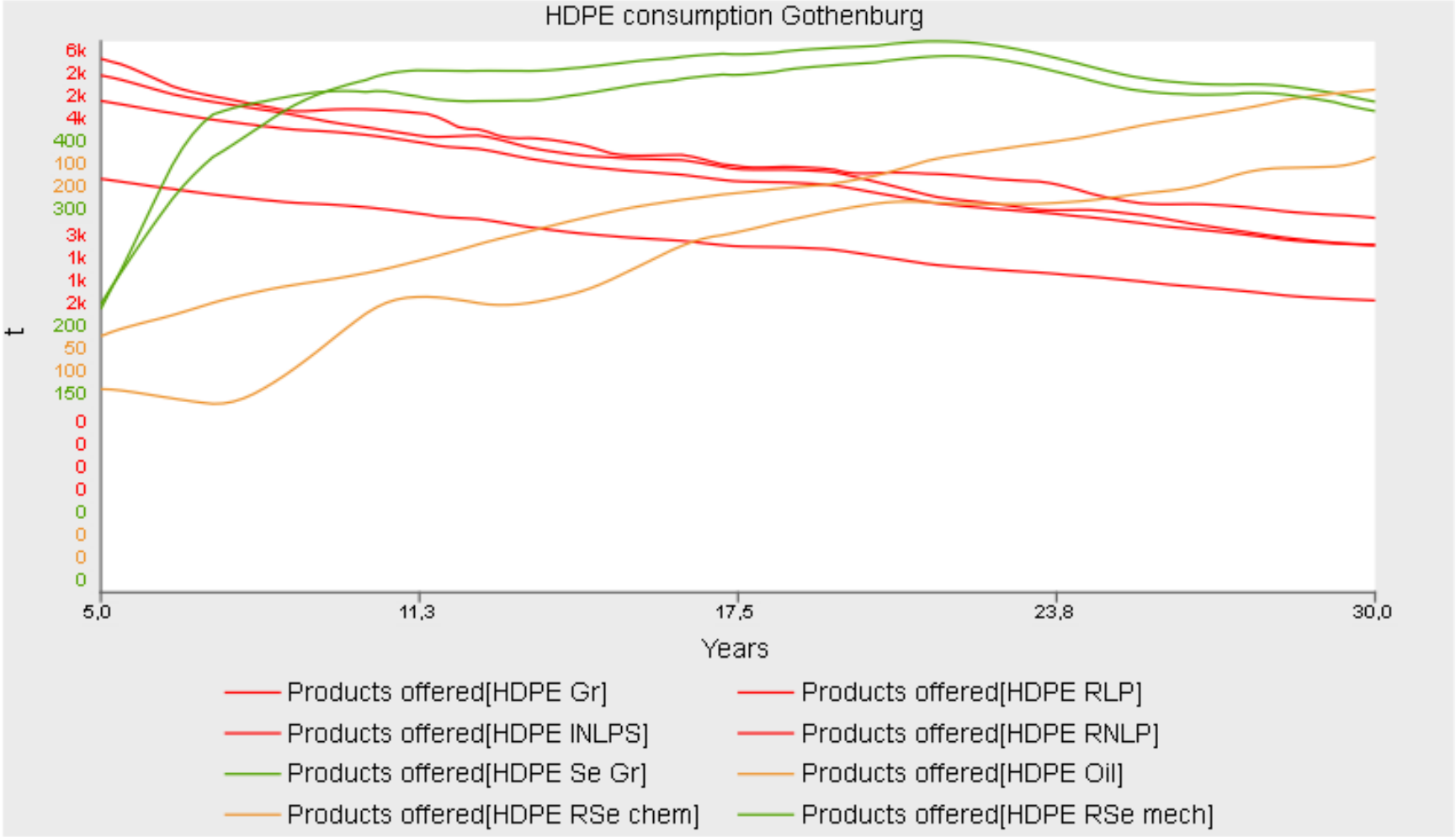
Results – Material Flows



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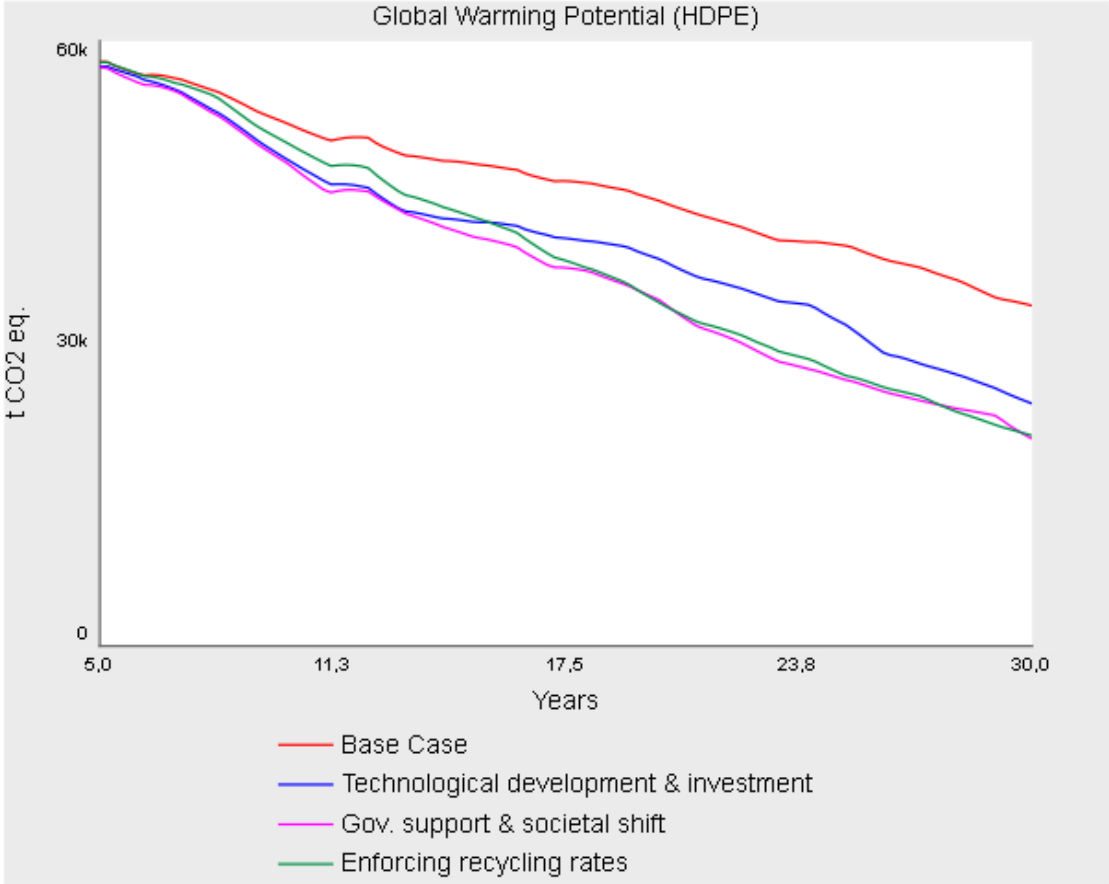
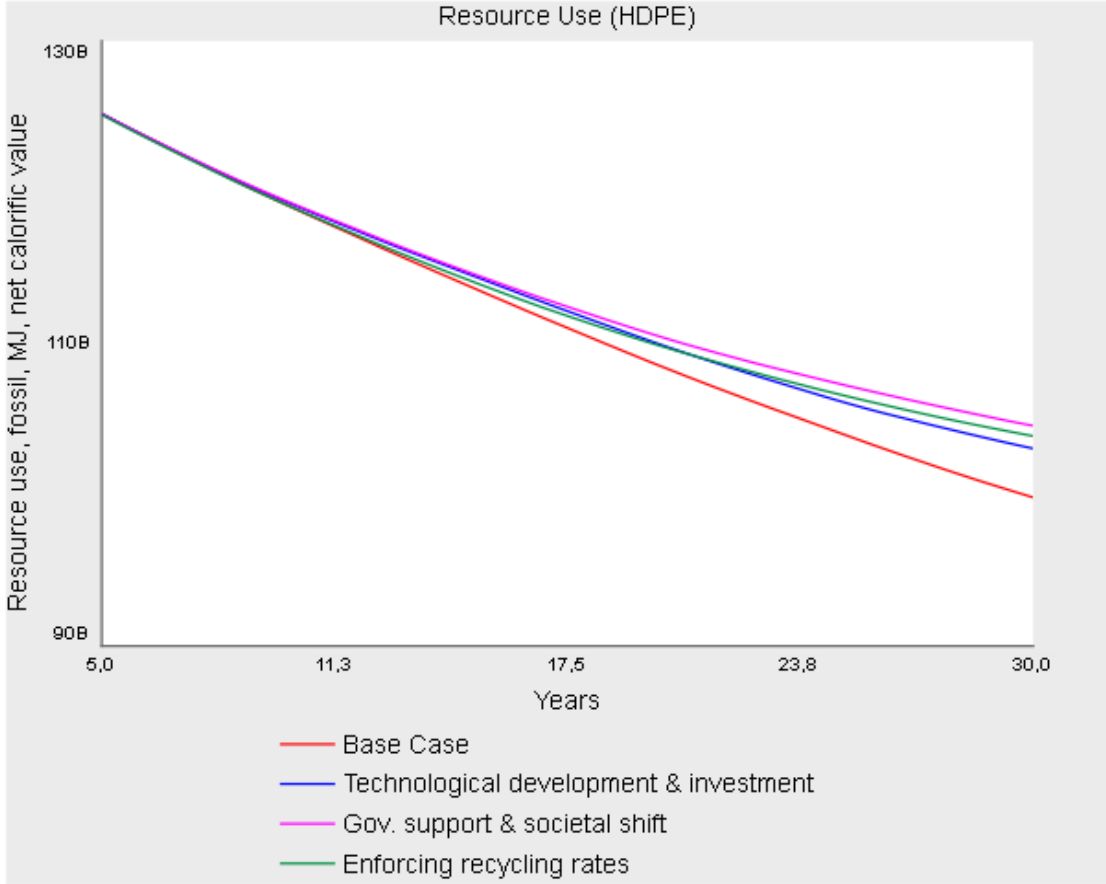
Results – Impact of different CE Strategies





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Outlook

- Possible to find the optimal mix of policies for a specific city or region
- Context-suitable strategies accelerate the transition to a circular economy
- Several challenges, but development is ongoing

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Thank you!

Alexander Koch

koch@greendelta.com

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