Chair of Information Systems
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Environmental Impacts of Business Processes

Analysis and Simulation with SimuBridge and the SOPA Framework

WHY SOPA?

Human activity in general, and organizations and their business processes in particular, significantly contribute to climate change and unsustainability

Existing solutions for making business processes more sustainable are limited in the environmental impacts they capture, and the support they offer for practice

To address this, we propose the *SOPA* framework for *Sustainability-oriented Process Analysis and Re-Design in Business Process Management*

SOPA combines business process analysis, business simulation, and LCA, for making business processes more sustainable, and consists *of five main steps*

I) PROCESS ELICITATION

Discover or model a *business process*, and identify entities that drive its environmental impact

→ What products and entities are involved in particular activities in a way that causes environmental impact?

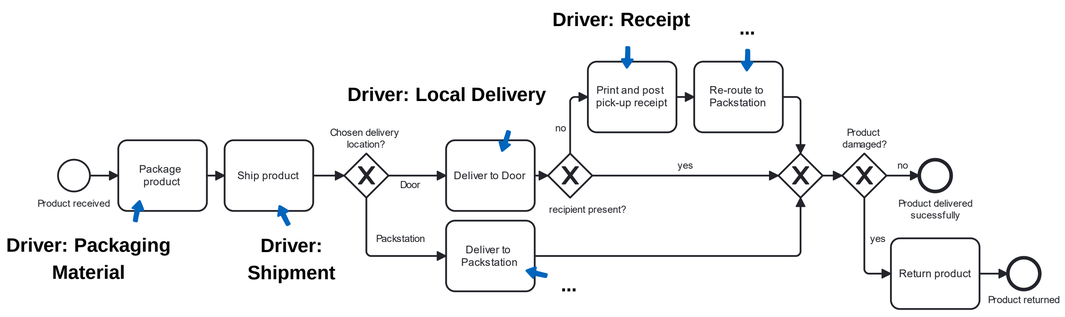
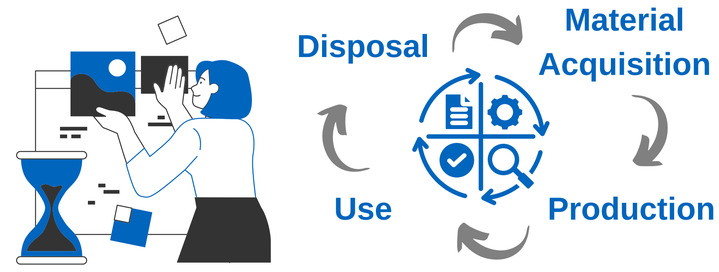


Fig. 1: Example logistics business process, some environmental drivers indicated

II) LIFE CYCLE ASSESSMENT

Quantify environmental impacts of various concrete environmental drivers using *Life Cycle Assessment* (LCA)

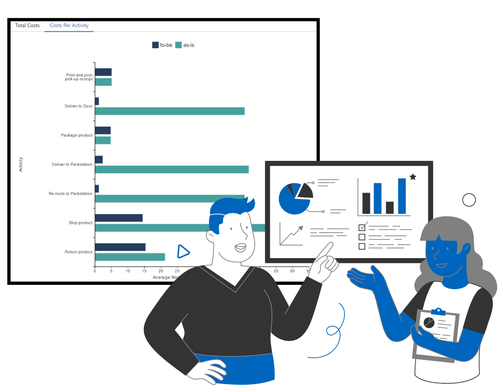
→ Holistic indicator across all life cycle phases of environmental drivers and all dimensions of environmental impact



III) ENVIRONMENTAL IMPACT CALCULATION

Analyse either a real-world event log or a simulated process execution using identified drivers of environmental impact and their environmental impact quantified with LCA

→ Where are hotspots of environmental impact? Are they due to the drivers, or due to process behaviour?



IV) RE-DESIGN AND IMPROVEMENT

Re-design the business process and quantify potential reductions in environmental impact with *business process simulation*

→ Change involved *drivers* (e.g., use different material)
→ Change process *behaviour* (e.g., operational support to encourage less impactful behaviour)
→ Change *both* simultaneously (e.g., new packaging material that increases likelihood of returns)

V) ITERATION AND IMPLEMENTATION

Assess whether re-designed business process brought expected reductions in environmental impact

If *yes*: Time to implement changes in practice!
If *no*: Start another re-design iteration!

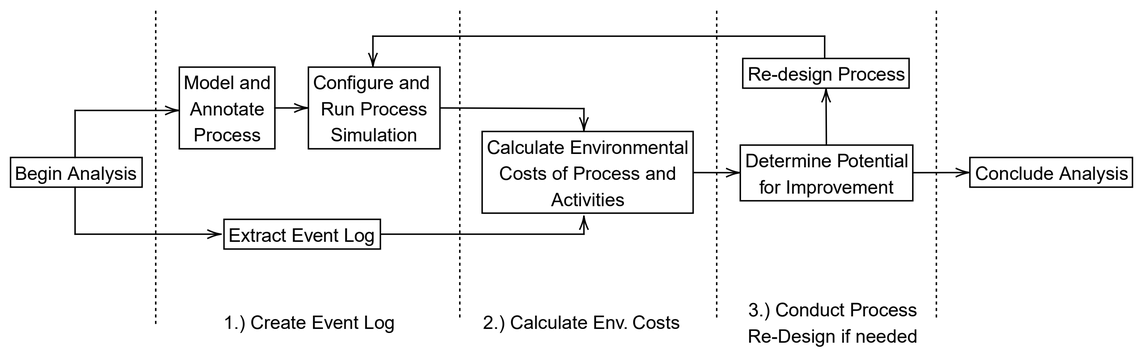


Fig. 2: Application procedure of SOPA

INTERESTED? READ ON HERE:

Klessascheck, F., Weber, I., & **Pufahl, L.** (2025). SOPA: A Framework for Sustainability-Oriented Process Analysis and Re-design in Business Process Management. *Information Systems and e-Business Management (ISeB)*.

Klessascheck, F., **Bein, L.**, & **Pufahl, L**. (2024). Simulating Environmental Impacts of Business Processes with SimuBridge and the SOPA Framework. *ICPM 2024 Tool Demonstration Track* (Vol. 3783). CEUR-WS.org.

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Check out our website!

Check out our tools on GitHub!