



Tool 7.1 Material Loop Map



Tool 7.1 – Material Loop Map

Phase 7 – Implementation & Operation

The Material Loop Map

Designed for:

Designed by:

Date:

Version:

FORWARD MATERIAL FLOW <i>How do materials and products currently flow through the system?</i> ☐ Raw materials sourced and input streams identified ☐ Production and manufacturing processes mapped ☐ Distribution and delivery routes to customers ☐ Primary packaging and transport documented ☐ Volume and weight of key material flows estimated	USE PHASE DYNAMICS <i>How are products used, maintained, and circulated during their use phase?</i> ☐ Average product lifespan and usage patterns ☐ Maintenance, repair, and servicing during use ☐ Product sharing, leasing, or subscription models ☐ Upgrade, adaptation, or reconfiguration opportunities ☐ Customer engagement and stewardship practices	REVERSE FLOW SYSTEM <i>How do products return into the system after use?</i> ☐ Take-back programmes and return trigger events ☐ Collection channels and logistics for return flows ☐ Consolidation hubs and sorting locations ☐ Assessment and triage of returned products ☐ Routing of products to appropriate recovery pathways
RECOVERY LOOPS <i>Which recovery loops are currently active or could be activated?</i> ☐ Reuse: redistribution without processing/intervention ☐ Repair: restoring functionality of damaged items ☐ Refurbishment: restoring products to good condition ☐ Remanufacturing: rebuilding with new components ☐ Recycling: recovering raw materials for reprocessing	LEAKAGE POINTS <i>Where and why is material value lost in the system?</i> ☐ Products disposed of instead of recovered or returned ☐ Materials downgraded or mixed during sorting ☐ Absence of collection infrastructure or incentives ☐ Products that cannot be disassembled or repaired ☐ Data loss preventing traceability and recovery routing	ECOSYSTEMS ACTORS <i>Which actors are involved in enabling or constraining material flows?</i> ☐ Suppliers and raw material producers ☐ Logistics and reverse transport partners ☐ Refurbishment and repair service providers ☐ Recyclers, processors, and secondary markets ☐ Customers, retailers, and facility managers
ENABLING INFRASTRUCTURE <i>What infrastructure and systems enable or limit circular material flows?</i> ☐ Reverse logistics and collection network capacity ☐ Digital Product Passport (DPP) and data systems ☐ Sorting, processing, and refurbishment facilities ☐ Traceability and lifecycle tracking platforms ☐ Partnership agreements enabling recovery activities	VALUE RETENTION LOGIC <i>How effectively is value retained across the lifecycle?</i> ☐ Value maintained at each recovery loop level ☐ Current vs potential value retention comparison ☐ Economic viability of each recovery option ☐ Environmental value from avoided waste and emissions ☐ Priority loops offering highest total value recovery	IMPROVEMENT OPPORTUNITIES <i>Where should we intervene to improve circular material flows?</i> ☐ Priority actions to close identified material loops ☐ Infrastructure or capability investments required ☐ New ecosystem partnerships to develop ☐ Digital enablement and traceability improvements ☐ Pilot initiatives or quick wins to test and scale

FRANCESCA

Circular Solutions for Furniture
A Horizon Europe Initiative

Objective of the Tool

The Material Loop Map helps organisations visualise how materials, components, and products flow across the entire lifecycle, from production to post-use recovery. The tool supports companies in identifying how value is retained, where leakage occurs, and which recovery strategies can be activated or optimised. It enables organisations to translate circular strategies into operational systems by making material flows and recovery loops explicit, actionable, and measurable.

What the Tool Is

The Material Loop Map is an operational visualisation tool used to map and analyse material flows within a circular system. It consists of two complementary components used in sequence.

The Material Loop Diagram helps visualise how materials from a specific product flow through a typical lifecycle — from raw material sourcing to end-of-use — and makes value leakages and potential circular recovery strategies visible.

The Material Loop Map Canvas then structures the insights from the diagram into nine analytical dimensions, covering forward flows, reverse logistics, recovery loops, ecosystem actors, enabling infrastructure, and improvement opportunities.

Together, the two components support organisations in translating circular strategies into operational systems by making material flows and recovery loops explicit, actionable, and measurable.

When to Use the Tool

The Material Loop Map is particularly useful in the implementation and operationalisation stages of circular transformation when organisations need to design, optimise, or scale material recovery systems. It can be used when companies are:

- Translating circular business models into operational flows
- Designing or improving reverse logistics systems
- Identifying material leakage and inefficiencies
- Planning reuse, repair, refurbishment, or recycling strategies
- Preparing pilots or scaling circular solutions
- Aligning ecosystem actors around material recovery systems
- Integrating Digital Product Passport (DPP) or traceability solutions

What You Need Before Starting

Before working with the Material Loop Map, ensure the following are in place:

- A specific product, product category, or material stream selected for analysis
- A cross-functional team if possible, drawing on operations, logistics, and product or service design
- Any available data on material inputs, volumes, take-back rates, or existing recovery activity
- Outputs from Tool 3.1 (Circular Maturity Assessment) if already completed — useful for contextualising identified gaps
- Approximately 90–120 minutes for a facilitated workshop session

How to Use the Tool

Before you start: — Select one specific product or product category to map — Assemble a cross-functional group (e.g. operations, logistics, product design) — Have available: any existing data on material inputs, volumes, or take-back rates.

The tool is used in two sequential parts. Start with the diagram to trace and visualise material flows, then move to the canvas to structure and deepen your findings.

Part A — Working with the Material Loop Diagram

Step 1 – Define System Scope: Select the product, product category, or material stream to be analysed. This scoping decision determines the boundaries of both the diagram and the canvas.

Step 2 – Map Forward Flows: In the annotation boxes on the diagram, describe the key materials, processes, and logistics at each lifecycle stage — from raw material sourcing through manufacturing, distribution, and into the use phase.

Step 3 – Map Use Phase Dynamics: Record how products are used, maintained, and circulated during their lifetime. Note lifespan, maintenance patterns, and any sharing or servicing activity directly on the diagram.

Step 4 – Map Reverse Flows: Identify how products are collected, sorted, and processed after use. Mark the collection channels and routing logic on the diagram.

Step 5 – Identify Recovery Loops: Using the loop arrows provided on the diagram, mark which recovery strategies currently apply — reuse, repair, refurbishment, remanufacturing, or recycling — and which could realistically be activated.

Step 6 – Identify Leakage Points: Using the  leakage symbols on the diagram, highlight where materials leave the system without being recovered. These are your priority improvement areas.

Part B — Completing the Material Loop Map Canvas

Once the diagram is complete, move to the canvas to structure your findings into nine analytical dimensions. Use the diagram as your primary reference throughout.

Step 7 – Map Ecosystem Actors: Identify the stakeholders involved at each stage of the lifecycle, including suppliers, logistics providers, service partners, and recyclers.

Step 8 – Identify Enabling Mechanisms: Map the logistics systems, digital tools such as Digital Product Passports, incentives, and infrastructure that support or constrain material flows.

Step 9 – Define Improvement Opportunities: Identify priority actions to increase value retention, reduce leakage, and strengthen recovery loops. Use the canvas to capture both quick wins and longer-term interventions.

Expected Output

The exercise produces a Material Loop Map describing:

- The flow of materials across the product lifecycle
- Key actors involved in forward and reverse flows
- Existing and potential recovery loops
- Critical leakage points and value losses
- The effectiveness of current recovery systems
- Opportunities to improve material retention
- Required ecosystem partnerships and infrastructure
- Key operational priorities for circular implementation

This visual map provides a foundation for designing efficient reverse logistics systems and improving circular performance.

Key Dimensions of the Material Loop Map

1. Forward Material Flow

Describes how materials move from raw material sourcing through production, distribution, and into the use phase.

Guiding question:

How do materials and products currently flow through the system?

2. Use Phase Dynamics

Captures how products are used, maintained, shared, or upgraded during their lifetime.

Guiding question:

How are products used, maintained, and circulated during their use phase?

3. Reverse Flow System

Describes how products are collected, transported, sorted, and redirected after use.

Guiding question:

How do products return into the system after use?

4. Recovery Loops

Identifies the different circular strategies applied to retain value, including reuse, repair, refurbishment, remanufacturing, and recycling.

Guiding question:

Which recovery loops are currently active or could be activated?

5. Leakage Points

Highlights where materials are lost, disposed of, or downgraded, reducing circular value.

Guiding question:

Where and why is material value lost?

6. Ecosystem Actors

Identifies the stakeholders involved across the lifecycle, including suppliers, logistics providers, service partners, and recyclers.

Guiding question:

Which actors are involved in enabling or constraining material flows?

7. Enabling Infrastructure and Systems

Describes the operational and technological systems supporting circular flows, including logistics, data systems, and digital tools such as DPP.

Guiding question:

What infrastructure and systems enable or limit circular material flows?

8. Value Retention Logic

Assesses how effectively value is preserved across different loops and identifies opportunities to prioritise higher-value retention strategies.

Guiding question:

How effectively is value retained across the lifecycle?

9. Improvement Opportunities

Identifies priority actions to optimise flows, reduce leakage, and strengthen circular performance.

Guiding question:

Where should we intervene to improve circular material flows?



Co-funded by
the European Union

Author: University of Vaasa) CC BY-NC-SA 4.0. Funded by the European Union under the grant agreement No 101182003. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the REA can be held responsible for them.

\FRANCESC/

Circular Solutions for Furniture
A Horizon Europe Initiative



Co-funded by
the European Union