

Mapping Sustainability in Construction Material Supply Chains

Sustainable Places 2025

Milan, 8 – 10 October 2025

Constantina-Dia Andreouli, Poulia Argiropoulou, Minos Eleftheriou
MIRTEC - Materials Industrial Research and Technology Center, Greece



Co-funded by
the European Union

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI



INdustrialised and PErsonalised Renovation for Sustainable sOcieties

INPERSO proposes innovative solutions that are flexible enough to adapt to the unique characteristics and needs of each building and user. It also promotes industrialized and digitalized processes to streamline retrofit operations, minimizing both time and disruption.

Technologies



22 Partners | 9 Countries |
48 Months | 9.1M Budget



Smart Wall
Prefabricated
all-in-one wall
panel



Energy Pod
Exhaust air
with heat
pump and
balanced
ventilation



BIPV
Tiles & balconies



Solar Window
PV venetian-
blind shading
device inside
an insulating
window



Façade 3D printer
Autonomous
system for
vertical printing
onsite

- **Objective:** Map the supply chain for the 5 INPERSO technologies, assess their qualitative sustainability performance and provide insights for improving circularity and resilience.

- ❑ **Understand the Construction Supply Chain**
- ❑ **Develop a Methodology to identify points to be improved**



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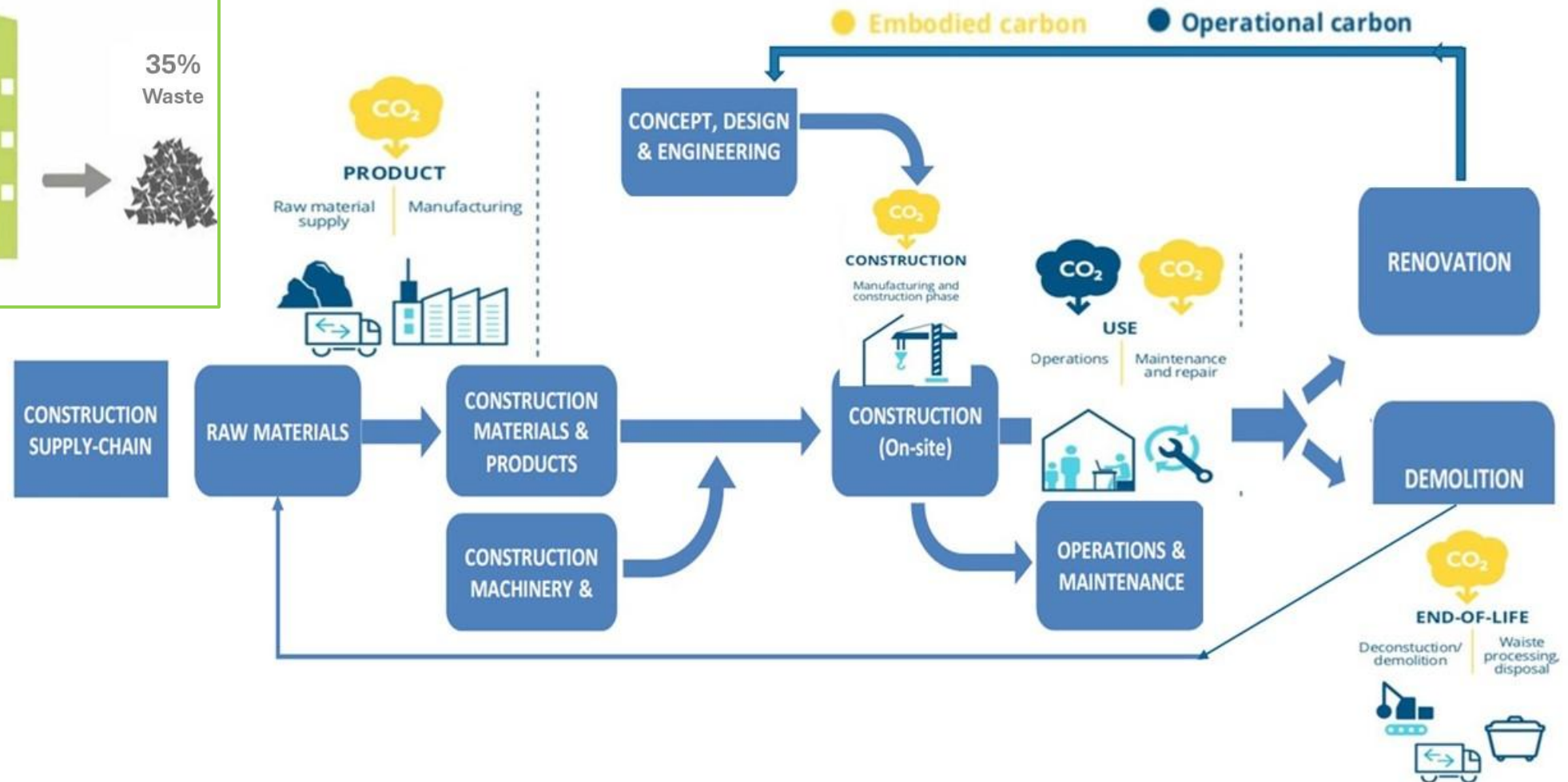
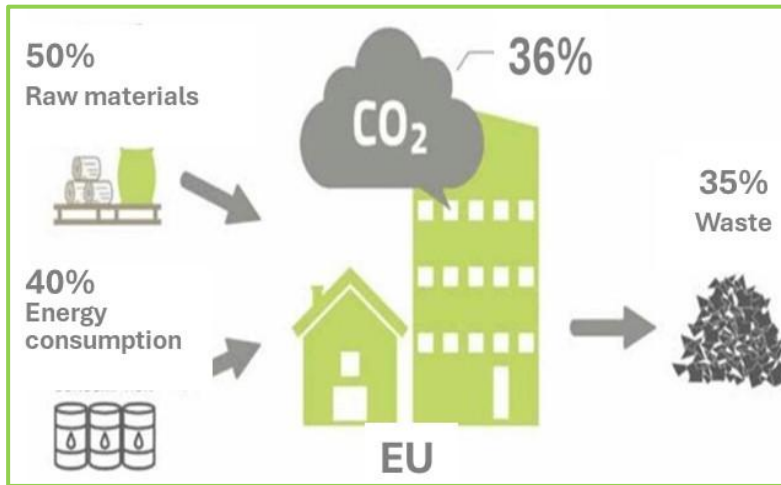


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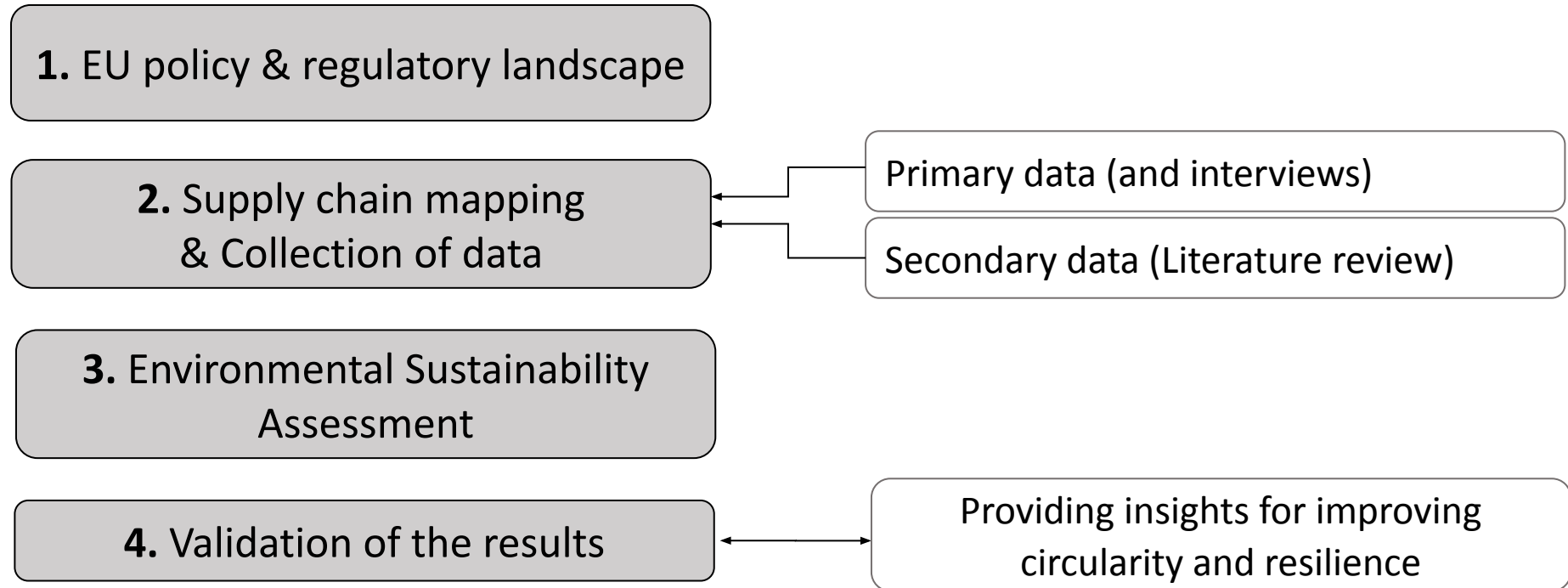
The Construction Value Chain

The construction sector value chain is characterized by a **high degree of complexity**, marked by **heavy dependence on raw materials** and **significant generation of emissions and waste across all stages of the life cycle**.



Establishment of sustainable material supply chains

Methodology for a qualitative analysis



EU policy & regulatory landscape

Sustainability & supply chains

EU Sustainability Reporting Directives

□ EU Non-Financial Reporting Directive (NFRD)

In Force: 2018–2024

Scope: companies in EU with >500 employees (~11,000)

□ Corporate Sustainability Reporting Directive (CSRD)

In Force: From 2025

Scope: All listed public interest entities + large companies (~50,000)

- Requires companies to publish detailed sustainability disclosures in a dedicated section of their annual management reports.
- Must explain how sustainability issues affect the company and how the company impacts society and the environment.
- Aims to increase accountability and transparency, enabling investors to access comparable sustainability metrics (EU Taxonomy).
- Includes **information on the entire value chain**: operations, products & services, business relationships, and supply chain.

□ Corporate Sustainability Due Diligence Directive (CS3D)

Promotes responsible business practices for sustainability

The CS3D enforces mandatory due diligence for large companies from July 2024

Among others, aims to identify and address **environmental impacts not only in their own operations but expands responsibility beyond tier 1 suppliers** to subsidiaries and entire supply chains for transparency and accountability.

EU Member states must implement the directive into national law by July 2026

In “scope” : Large companies (6000 EU based & 900 Non - EU based).

Indirect Impact on SMEs.

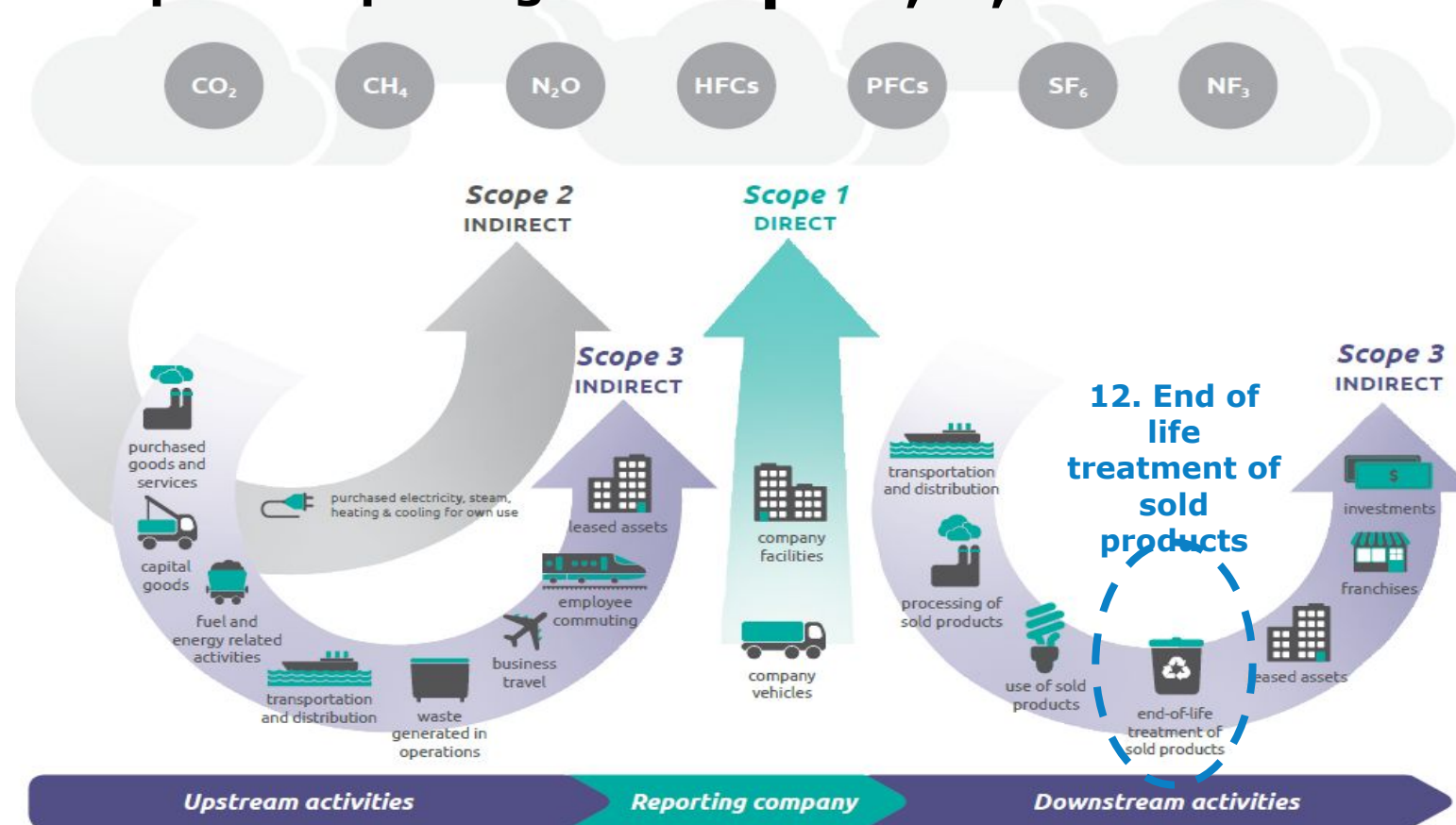
As direct or indirect business partners in the chain(s) of activities of larger companies in scope.

CS3D and CSRD are two complementary EU legislative initiatives with different focus.

CS3D mandates a transition plan, while CSRD requires reporting on such plans.

Greenhouse Gas Protocol – Scope 3 Emissions

CSRD requires reporting on Scope 1, 2, and 3 emissions



Source: World Resources Institute & World Business Council for Sustainable Development, 2013

Scope 1: Direct emissions from owned or controlled sources

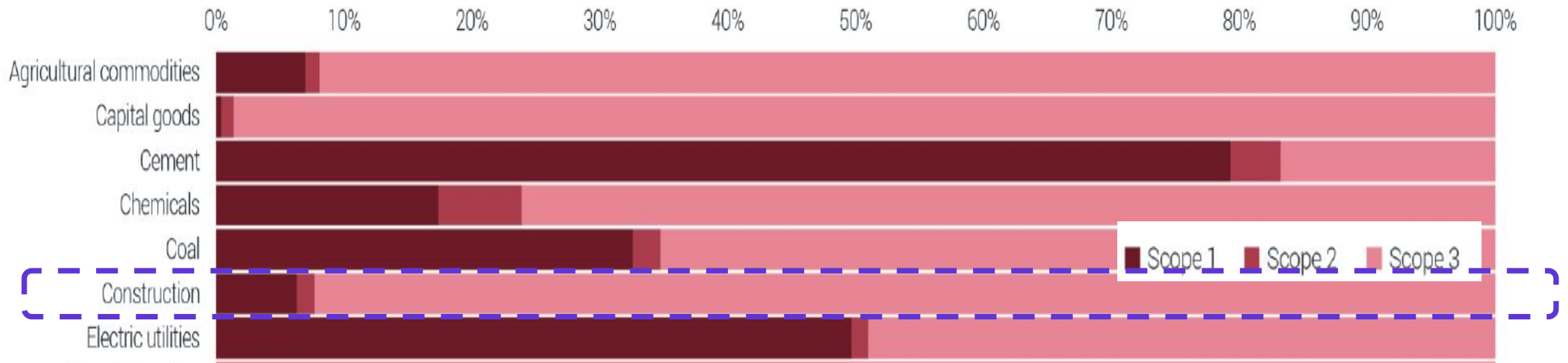
Scope 2: Indirect emissions released by off-site energy providers when a company purchases energy.

Scope 3: All, both upstream and downstream indirect emissions that occur in a company's value chain (e.g., supplier emissions, emissions released from use or disposal of a product or service).

Scope 3 Inventory & Challenges

□ Companies with high Scope 3 emissions should take immediate actions

- identify major emission "hotspots" through a screening process & engage key suppliers and customers to set reduction targets
- Implement efficient logistics.
- Implement circular economy principles to reduce waste and improve resource efficiency across the value chain.



Source: CDP Technical Note: Relevance of Scope 3 Categories by Sector, 2025

□ The New EU Construction Products Regulation (CPR-EU 2024/3110)

- Into effect on 7.1.2025, most provisions become applicable from 8.1.2026.
- It reinforces **importance of sustainability** in construction materials
- **Annex I** includes **Sustainable use of natural resources** as the 8th basic requirement for the harmonized technical specifications.

■ The basic requirements for harmonized technical specifications:

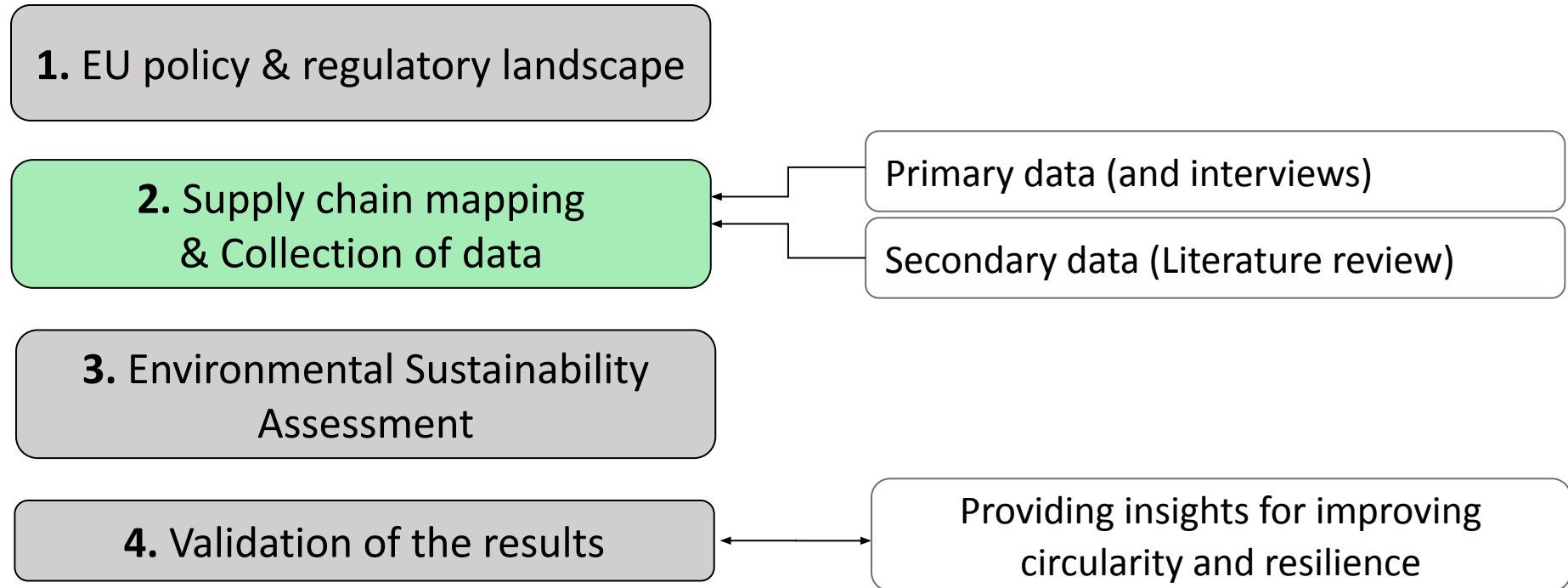
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|---|--|
| 1. Structural integrity | 6. Energy economy and thermal performance |
| 2. Fire safety | 7. Emissions into the outdoor environment |
| 3. Protection against adverse hygiene & health impacts | 8. Sustainable use of natural resources |
| 4. Safety and accessibility | |
| 5. Resistance to the passage of sound & acoustic properties | |

□ The revised Energy Performance of Buildings Directive (EU/2024/1275, EPBD)

- Into force on 28.5.2024; need to be transposed into national laws by 29 May 2026.
- Revised to increase the rate of renovation in the EU and incorporate circularity by requiring the calculation and disclosure of a building's life cycle **Global Warming Potential (GWP)** on energy performance certificates (EPCs).
- **Mandatory GWP Reporting Timeline for Member States**
 - From Jan 1, 2028: All new buildings >1,000 m²
 - From Jan 1, 2030: All new buildings

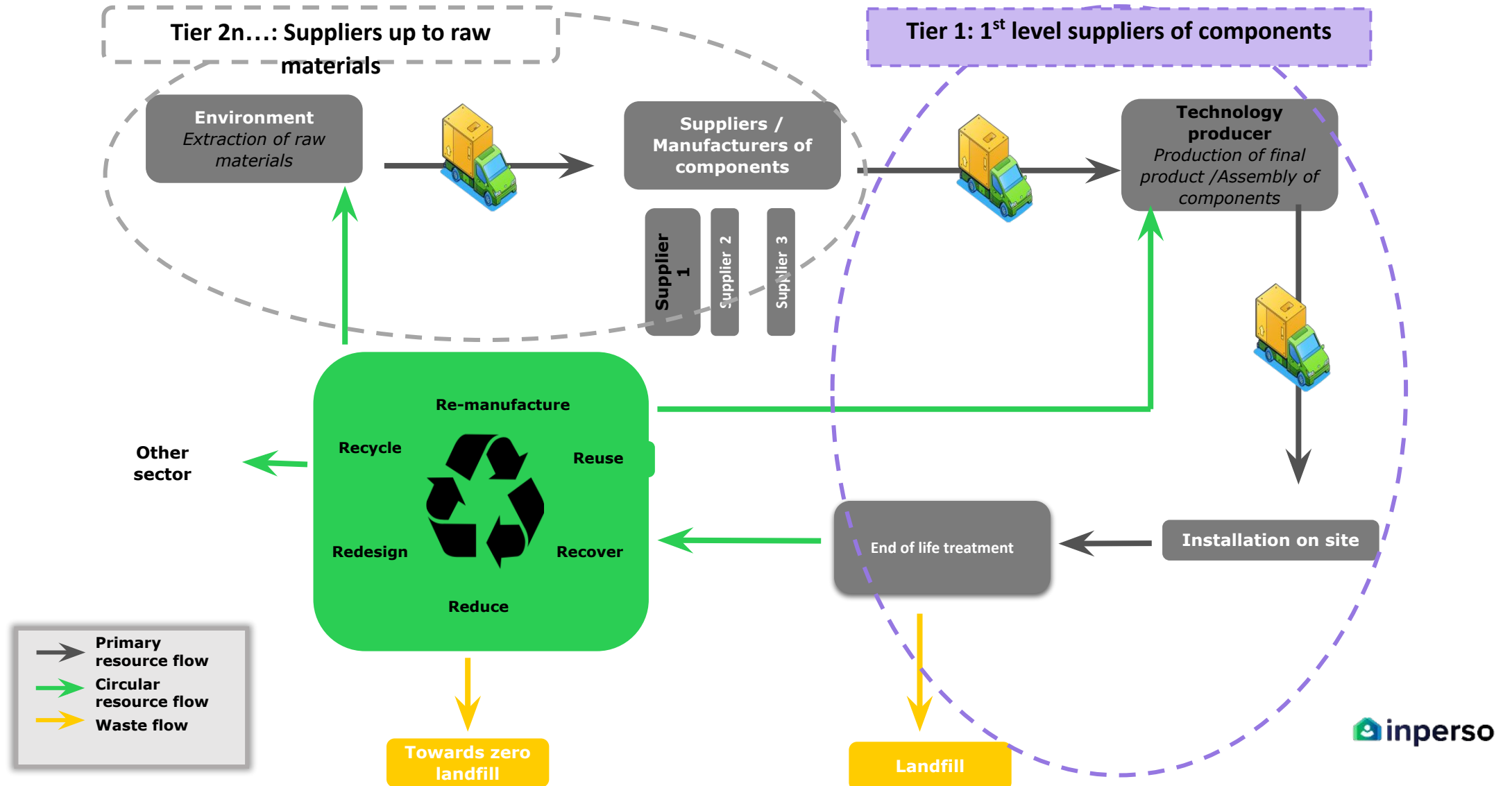
Establishment of sustainable material supply chains

Methodology for a qualitative analysis



INPERSO Supply chain mapping & Collection of data

- Analysis of each INPERSO technology down to its superassemblies, assemblies, components



INPERSO technologies Supply chain mapping



Input -Challenges

1. Primary data

Difficulties during primary data collection from technologies providers (non-uniformity of collected data, reference only on 1st tier suppliers)

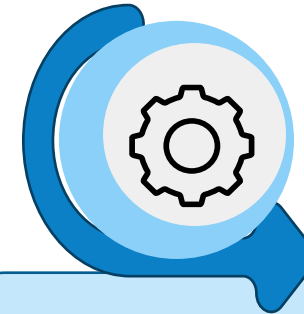
2. Secondary data

Use literature, not specific to company's value chain, difficult to track performance.



Focus

To overcome challenges in forward supply chain data collection, the analysis was redirected toward evaluating sustainability in the **reverse supply chain.** (focus on the backward flow of materials and products).



Process/Assessment 6 evaluation criteria

1. Locality of 1st level suppliers
2. Degree of geographical concentration within the supply chain
3. Alignment with DfD principles
4. Resilience of the supply chain with regard to critical and strategic raw materials
5. Efficiency of reuse and recycling processes
6. Efficient collection networks



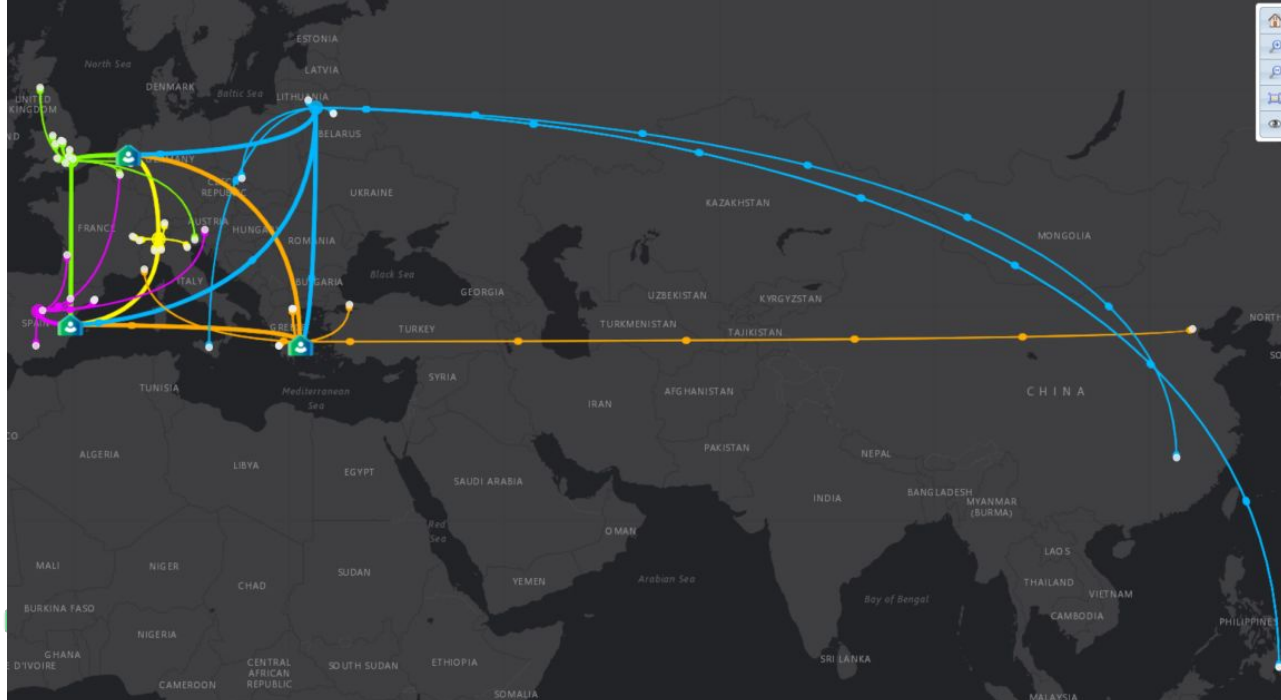
Output

1. GIS visualization tool
2. Excel based tool for supply chain primary data collection
3. Material flows and key material requirements per technology
4. Circularity & sustainability performance per technology
5. Insights for improving circularity & resilience.

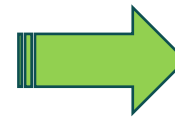
Visual representation of material flows for INPERSO technologies - A GIS tool

- A Geographic Information System (GIS) visualization tool was developed for INPERSO technologies.
- It tracks all the material flows, from 1st level suppliers to INPERSO technology provider facilities and then to the locations of the demonstration buildings, where installed.
- It identifies key supply chain players while tracking the flow of goods and offer better visibility into companies' operations.

A visual comparison of the supply chain map before and after the improvements introduced through the sustainability assessment



 inperso



CDW reduction for sustainable supply chains

- A baseline is needed for the quantitative assessment of the CDW improvement compared to conventional solutions □ EPDs are a possible source

Difficulties

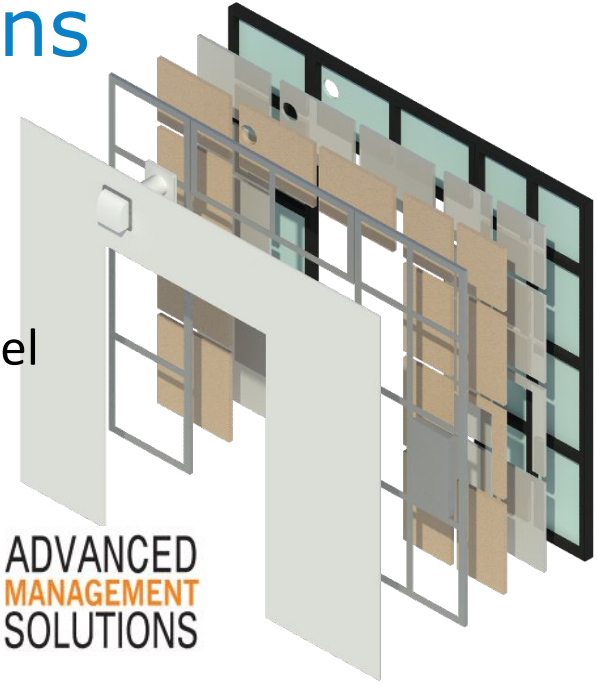
- Most of published EPD certificates examine A1-A3 life cycle stages [**A1** (Raw Material Supply)- **A2** (Transport)- **A3** (Manufacturing)].
- Only a few include A4–A5 (Construction -Transport to Site), B1–B7 (Use Stage) and C1–C4-D (End-of-Life Stage and Beyond).
- Even using relevant published EPDs, differences in some characteristics necessitate assumptions for calculations to be comparable

ENVIRONMENTAL PERFORMANCE INDICATORS										
XX										

CDW reduction for sustainable supply chains

An INPERSO case study

A prefabricated façade for renovation of buildings



- ✓ The panels support a wide selection of materials and can have different size and level of industrialization, including a combination of elements.
- ✓ They allow for easy redesign to improve sustainability performance- reduce CDW.
- ✓ Comparison with conventional ETICS and published EPDs



Results

- **Integration of DfD methodologies into the design phase**
 - ✓ **Replace chemical fasteners with mechanical ones** → Enables easier disassembly, component separation, selective demolition, reduces CDW.
- **Careful material selection** □ Choosing specific materials and coatings increases recyclability and reduces construction waste during selective demolition.
 - ✓ **Use of inorganic Coatings on cement Boards** □ Enables recyclability under selective demolition. Potential CDW reduction: **close to 98.5%**.
 - ✓ **Use of Lightweight cladding that allow mechanical fixation**, in compliance with DfD principles → Potential CDW reduction: **up to 60%**.



Conclusions

The lifecycle supply chain holds significant potential to drive sustainability in construction.

By:

- Early adoption of Design for Disassembly principles (DfD)
- Careful material selection
- Implementing efficient logistics & Screening/engaging key suppliers

Technology providers

can **boost product circularity, minimize construction and demolition waste (CDW), and enhance resource efficiency across the value chain**—ultimately **improving the environmental performance** of their products.

SUSTAINABLE PLACES 2025



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Thank you

