# ENKORE
# ECO HEALTHCARE

PROPELLING THE SHIFT TOWARD THE FUTURE OF CIRCULAR, SAFE AND SUSTAINABLE PACKAGING AND SINGLE USE DEVICE ECODESIGNED SOLUTIONS THROUGH HEALTHCARE ENVIRONMENTS.

## Minimizing the Ecological a nd Economic Burden of Medication Waste in Europe

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Universidad Politécnica de Madrid | UPM

*Maria Eugenia Beltrán Jaunsarás*

This project is supported by the Innovative Health Initiative Joint Undertaking (IHI JU) under grant agreement No 101166707. The JU receives support from the European Union's Horizon Europe research and innovation programme and COCIR, EFPIA, Europa Bío, MedTech Europe, and Vaccines Europe.

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ECO HEALTHCARE

# ENKORE

*Propelling the shift toward the future of circular, safe and sustainable packaging and single use device ecoDesigned solutions through healthcare environments.*

**Duration:** 48 months

**38 partners** (10 EU countries + Switzerland +Bosnia and Herzegovina + USA)

**Total budget: 18,6 M€**

PHARMACEUTICS & MED-TECH

Boehringer Ingelheim
Lilly
FRESENIUS MEDICAL CARE
DePuy Synthes
Johnson & Johnson
Medtronic 75
novo nordisk
Pfizer
Takeda
DUPONT
Baxter

# MAIN GOAL

## ACCELERATING INNOVATION THROUGH ECODESIGN

**Vision**

ENKORE aims to drive accelerated innovation by *establishing an ecoDesign framework that is circular, safe & sustainable by design (SSbD)* for safer, greener, and more efficient healthcare solutions for the future.

**Approach**

**Holistic Product Lifecycle** *: From materials selection and product design to end-of-life,* we aim at the development of environmentally responsible patient solutions (circular packaging and single-use medical devices) while *ensuring patient safety, regulatory compliance, and reduced environmental impact/carbon footprint.*

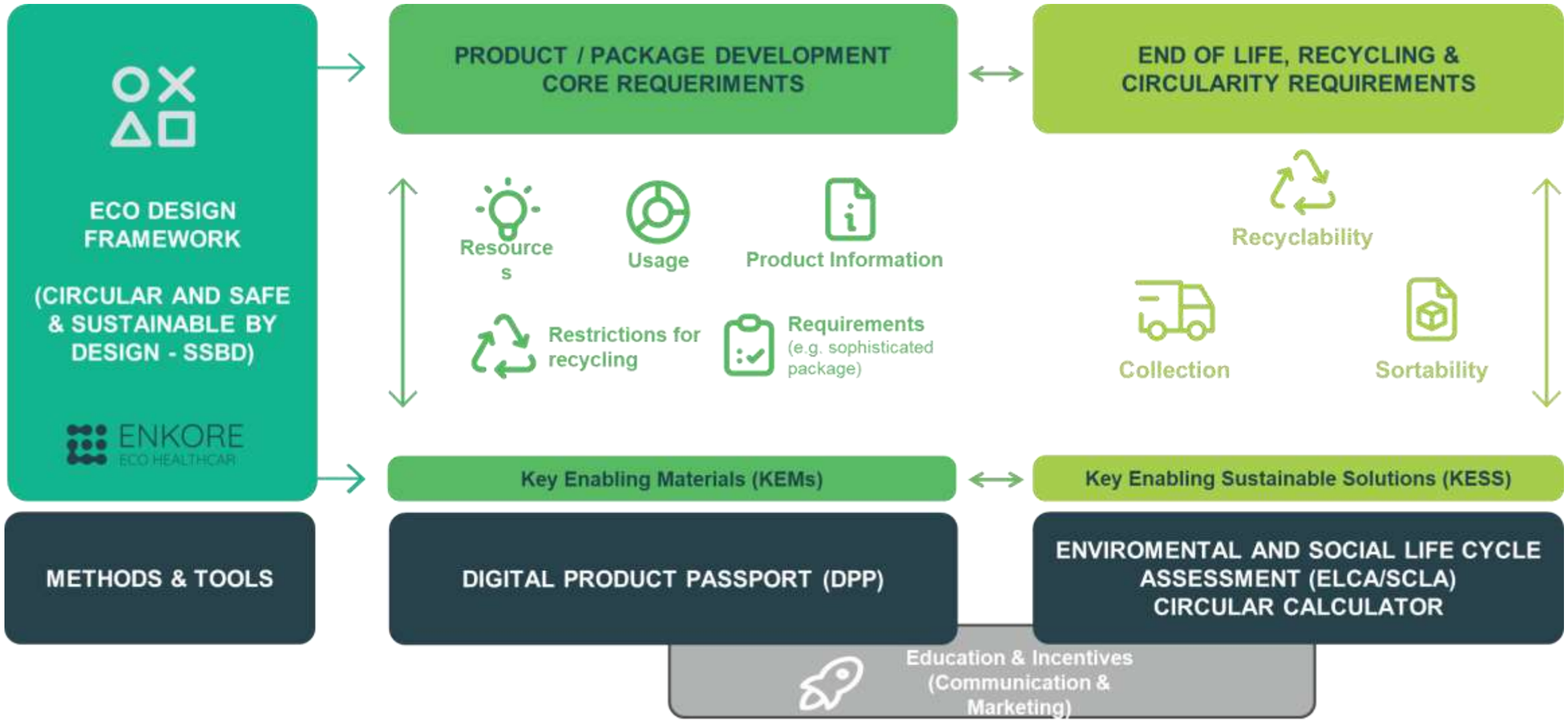
**Methods & Tools**

Advanced data, technologies, and best practices:

✓ Environmental & Social Life Cycle Assessment (ELCA/SLCA)
✓ Circularity Calculator (CC)
✓ Digital Product Passport (DPP)

→ Validating and evaluating in closed-loop systems (Hospitals & Patients)

# ENKORE CONCEPT



# REFERENCE USE CASES

## RUCS: 5 reference use cases with focus on SUDs & Packaging

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**SINGLE USAGE DEVICES (SUDs)**

- Drug injection devices
- Single use products for dialysis, intravenous, nutrition and irrigation therapies
- To scale the recycling of healthcare related medical devices and packaging after use in the hospital setting

**PACKAGING**

- Sustainable plastic material for packaging
- Sustainable cellulose material for packaging

# Project Phases

## Objectives and approach

Conceptualization | Modelling | Implementation | Testing & validation | Outreaching & dissemination

### Conceptualization

**1. Evidence Mapping & Synthesis**

Conduct **downstream research** to evaluate **current and emerging circular materials** for packaging and devices.

Explore **upstream circularity frameworks** to understand their impact on cost-benefit analysis, patient satisfaction, and safety.

**2. Capture Stakeholder Requirements for Real-World Use Cases.**

Gather insights from **regulators, industry, healthcare providers, and patients**. Define and federate **Reference Use Cases (RUCs)** for testing and implementation.

### Modelling

**3. Create a Catalogue of Key Enabling Materials (KEM) & Sustainable Solutions (KES)**

Identify essential **materials and circular solutions** for packaging and medical devices.

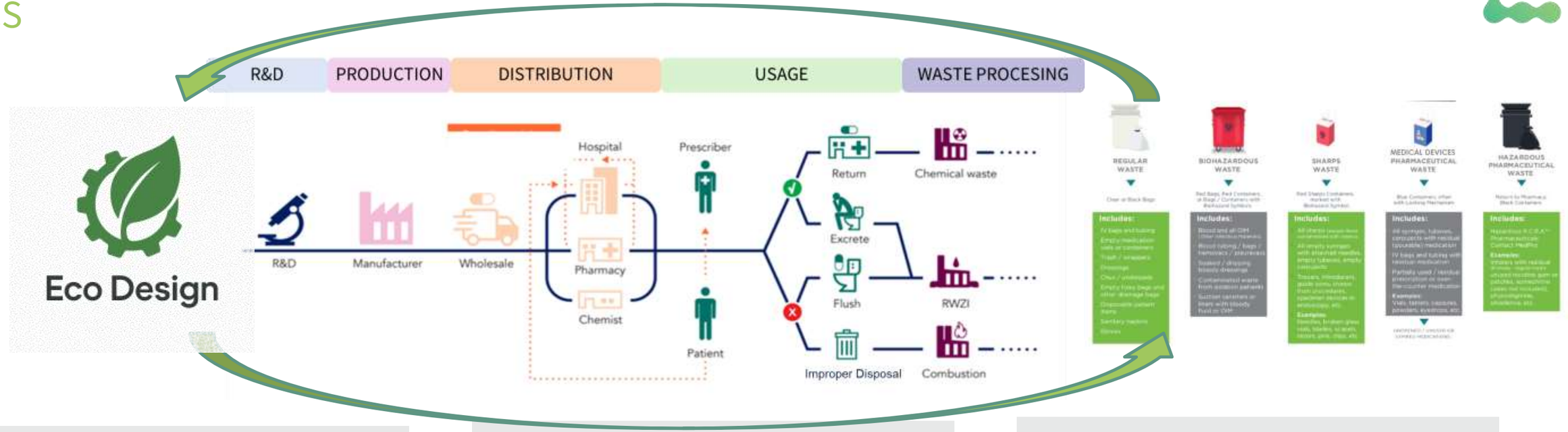
Facilitate pathways from **KEM to KES and vice versa** to promote material circularity.

**4. Develop an ecoDesign Framework for Packaging & Devices**

Support the development of **eco-responsible packaging and single-use devices**.

Enable a **closed-loop system** ensuring sustainability from design to disposal.

# REFERENCE USE CASES
## RUCS




## 1.

Investigate current waste management practices at hospitals/patients including and explore opportunites to go beyond current practices.

- *Process Mapping (SSbD/LCA, Calculator)*
- *Material Catalogue (DPP)*

## 2.

Develop guidelines/standards for hospitals and waste management stakeholders to enable efficient recycling for both contaminated & non-contaminated materials.

- *Socio Economic Assesment*

## 3.

Establish viable, sustainable and cost-effective recycling processes & “economic system” that can be scaled for efficient recycling → for  both contaminated & non-contaminated materials.

Materials to be brought back into Loop.

# REFERENCE USE CASES

## RUC Example

Drug injection devices



- Syringes, pre-filled syringes and pens used mostly at home
- Biologically active proteins:  such as insulin (proteins), antibodies, recombinant factors, etc.
- Mostly could be contaminated by patient (fluids) after usage and/or drug (e.g. contains antibodies that can affect the people)
- Different plastics, metals and materials for the devices, (e.g. connectors, etc.)


1. Drug combination devices and the increasing volumes of pens/autoinjectors/pre-filled syringes.

2. No industry standard for circular material selection in the design, and there are often multiple materials.

3. High-quality standards for devices limits opportunities for circular design and choice of sustainable materials.

4. Recycling opportunities are limited and restricted by legislation on hazardous/sharps waste.

# IMPACT: KEY CONTRIBUTIONS

1

### Strengthening European healthcare industry

- **Evidence-based short circuit models** at ENKORE RUCs.
- **Circular approaches** in packaging & medical devices.

2

### Systemic change at device packaging end of life

- Driven by **SSbD** principles with **ELCA/SLCA tracking**.
- **Evidences and guidelines for standardized Systemic change** with waste recycling & material tracking.

3

### Driving research & best practices

- **Validated and Referential use cases**
- **Lessons learned** from ENKORE RUCs feed into guidelines.
- Framework **feedback loop** for continuous improvement.

4

### Alignment with the European Green Deal

- Healthcare **adopts sustainability metrics** in decision-making.
- Evidence-driven **goal alignment with EU net-zero** strategy.

5

### Enabling open & closed-loop circularity

- **KEMs support material recycling** & eco-friendly product design.
- **KES fosters new materials** (e.g., biobased polymers) and standardized end-of life processes for circular adoption.

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# Thank you!

*Get in touch!!* *contact@enkore.eu*

*Xenia BELTRÁN JAUNSARÁS me.beltran@upm.es*

*ENKORE web: www.enkoreecohealthcare.eu*

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