SSbD Implementation II: Circularity

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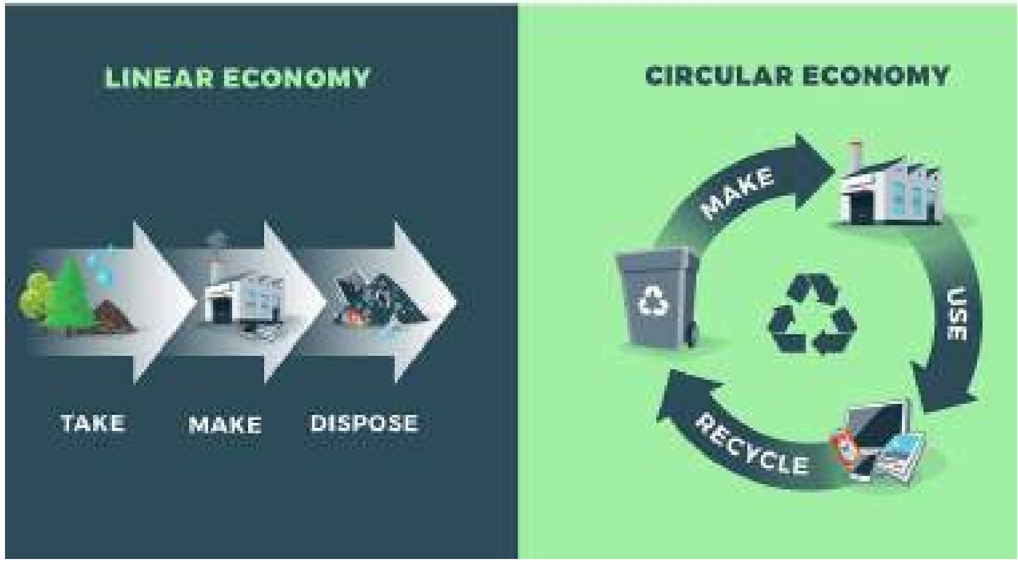
Circular economy concept

The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the **life cycle of products is extended.**

In practice, it implies **reducing waste to a minimum**. When a product reaches the end of its life, its materials are kept within the economy wherever possible. These can be productively used again and again, thereby **creating further value.**

This is a departure from the traditional, linear economic model, which is based on a take-make-consume-throw away pattern. This model relies on large quantities of cheap, easily accessible materials and energy.



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Identification of opportunities for circular value capture	• Includes the **searching of technical, economic, social and environmental opportunities** that allows promoting a circularity approach of materials and related packaging products
Circular KPIs assessment	• Appropriate **circular economy indicators** will be defined to assess how circular the materials flows are • **Complementary indicators** that will allow addressing additional impacts and risks will be considered • The transition towards a circular economy in the new materials development and packaging products production value chain will be measured and evaluated
Evaluation of circularity scenarios	• **Potential scenarios will be analysed** to improve circularity

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1. Identification of opportunities for circular value capture → The RESOLVE framework

The **ReSOLVE framework developed by Arup and Ellen MacArthur Foundation** consists of Regenerate, Share, Optimize, Loop, Virtualise and Exchange to support circularity in the built environment.

REGENERATE

- Shift to renewable energy and materials
- Reclaim, retain, and restore health of ecosystems
- Return recovered biological resources to the biosphere

SHARE

- Share assets (e.g. cars, rooms, appliances)
- Reuse/secondhand
- Prolong life through maintenance, design for durability, upgradability, etc.

OPTIMISE

- Increase performance/efficiency of product
- Remove waste in production and supply chain
- Leverage big data, automation, remote sensing and steering

LOOP

- Remanufacture products or components
- Recycle materials
- Digest anaerobically
- Extract biochemicals from organic waste

VIRTUALISE

- Dematerialise directly (e.g. books, CDs, DVDs, travel)
- Dematerialise indirectly (e.g. online shopping)

EXCHANGE

- Replace old with advanced non-renewable materials
- Apply new technologies (e.g. 3D printing)
- Choose new product/service (e.g. multimodal transport)

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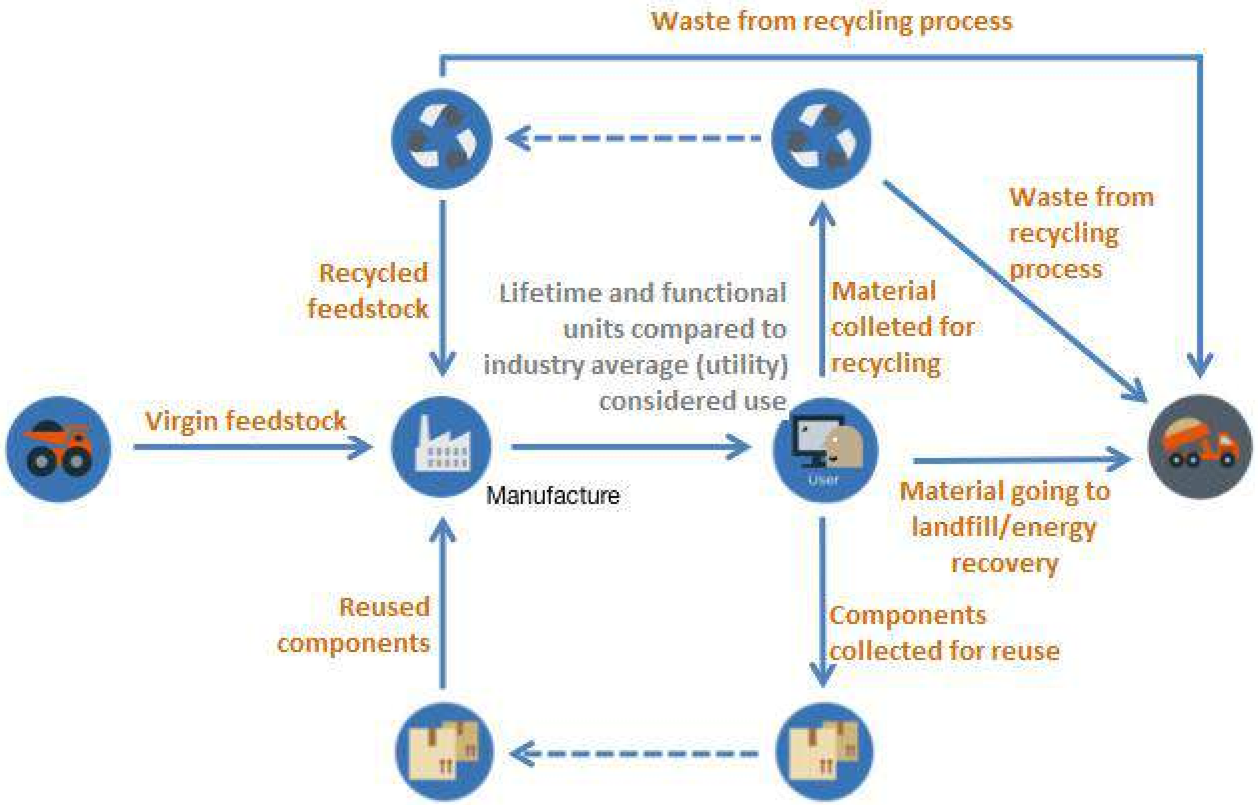
2. Identification of circular KPIS:

The **Material Circularity Indicator (MCI)** for a product measures the extent to which linear flow has been minimised and restorative flow maximised for its component materials, and how long and intensively it is used compared to a similar industry-average product.

The MCI is essentially constructed from a combination of three product characteristics: the mass V of virgin raw material used in manufacture, the mass W of unrecoverable waste that is attributed to the product, and a utility factor X that accounts for the length and intensity of the product's use.



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2. Identification of circular KPIS:

0 < MCI < 1

Any product that is manufactured using only virgin feedstock and ends up in landfill at the end of its use phase can be considered a fully **'linear' product, MCI = 0**.

On the other hand, any product that contains no virgin feedstock, is completely collected for recycling or component reuse, and where the recycling efficiency is 100% can be considered a **fully 'circular' product, MCI = 1**.

In practice, products will sit somewhere between these two extremes and the MCI measures the level of circularity in the range 0 to 1.

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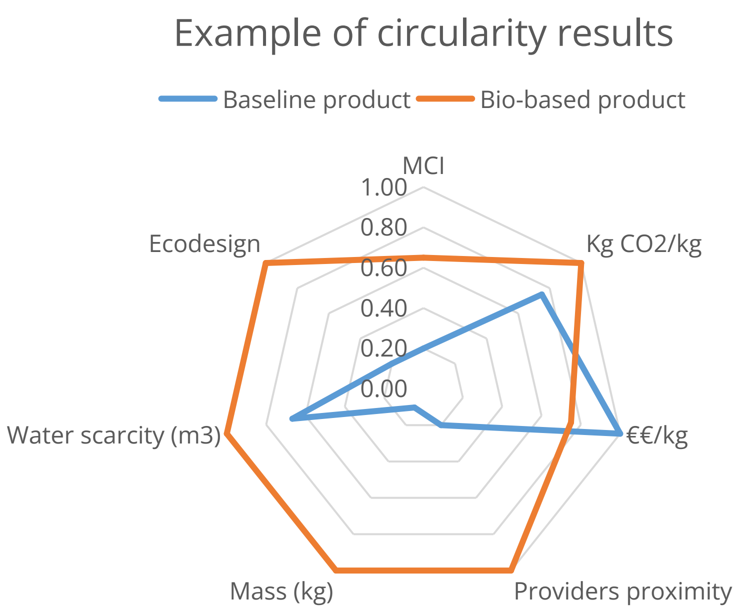
PRESERVE

2. Identification of circular KPIS of PRESERVE:

Preliminar circular indicators for PRESERVE
MCI
Carbon footprint: Kg CO2/Functional unit
€€/Functional unit
Mass (kg)
Water scarcity (m3 depriv /Functional unit)
Ecodesign



In this example, a score of 1 is the best performance, and 0 is the worst performance.

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SSbD implementation III: conclusions of integration of SSbD results

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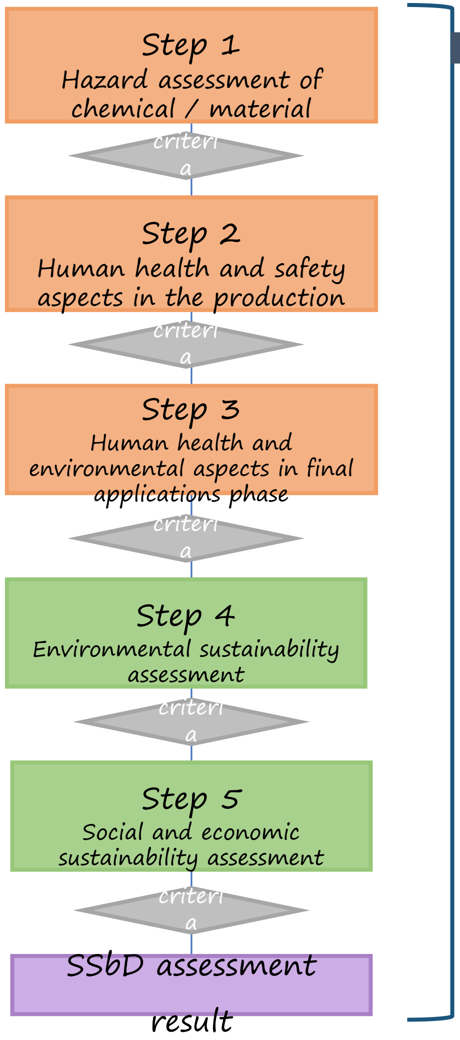

Risk level	Acute human health hazards	Chronic human health hazards	Physical properties	Hazards from release behaviour	Process-realted hazards	Safety	
Very high-risk	0	0	0	0	0	0	Very high risk
High-risk	1	1	1	1	1	1-5	High risk
Medium-risk	2	2	2	2	2	6-10	Medium-risk
Low-risk	3	3	3	3	3	11-15	Low-risk
Neglible risk	4	4	4	4	4	16-20	Neglible risk

SCORE FOR STEP 1

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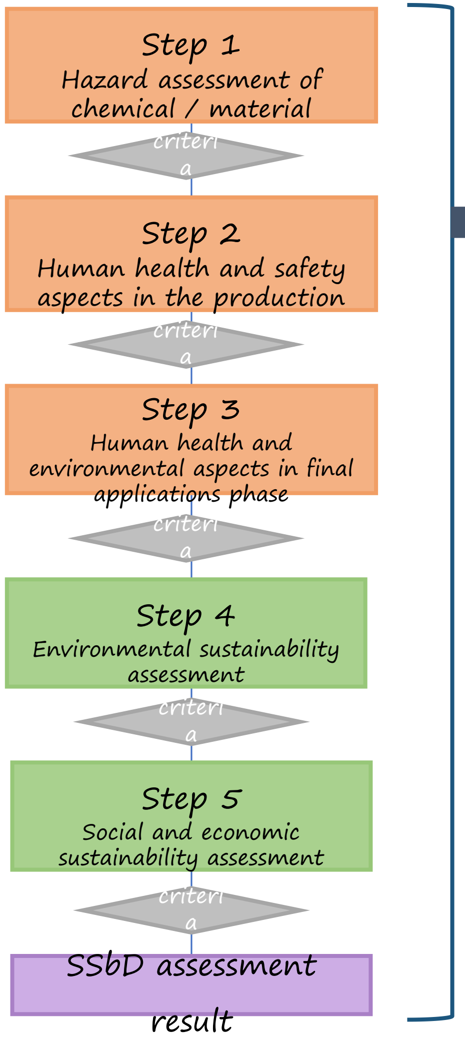

Position to safe level	Score	Color code	Criteria evaluation
> Safe level + 50%	0		Fail the criteria
> Safe level; < Safe level + 50%	1		
> Safe level - 25%; < Safe level	2		Pass the criteria
> Safe level - 50%; < Safe level - 25%	3		
< Safe level - 50%	4		

SCORE FOR STEP 2

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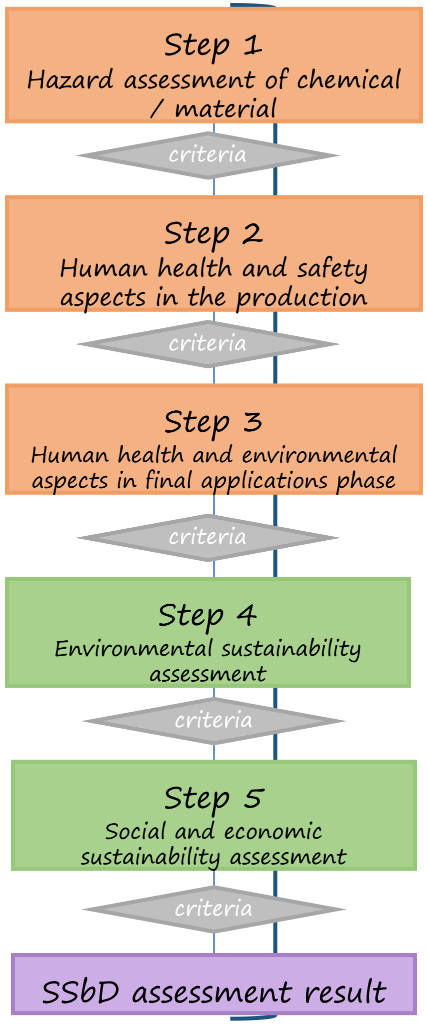

Position to safe level	Score	Color code	Criteria evaluation
> Safe level + 50%	0	(red)	Fail the criteria
> Safe level; < Safe level + 50%	1	(dark orange)	
> Safe level - 25%; < Safe level	2	(yellow)	Pass the criteria
> Safe level - 50%; < Safe level - 25%	3	(yellow-green)	
< Safe level - 50%	4	(green)	

SCORE FOR STEP 3

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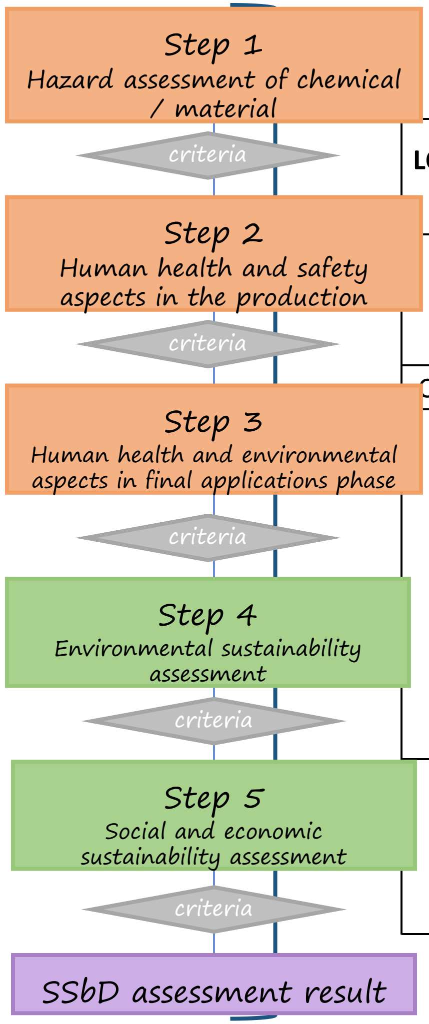

LCA Assessment level	Aspect	Position to reference (improvement %)	Score
Toxicity	Human Toxicity, cancer	10	2
	Human Toxicity non cancer	25	3
	Ecotoxicity	56	4
Climate Change	Climate Change	5	1
Pollution	Ozone depletion	35.6	3
	Particulate matter/Respiratory inorganics	-10	0
	Ionising radiation, human health	0	0
	Photochemical ozone formation	1	1
	Acidification	20	2
	Eutrophication, terrestrial	40	3
	Eutrophication, aquatic freshwater	41	4
	Eutrophication, aquatic marine	21	3
Resources	Land Use	20	2
	Water use	33	3
	Resource use, minerals and metals	89	4
	Resource use, energy carriers	21	3
			38

SCORE FOR STEP 4

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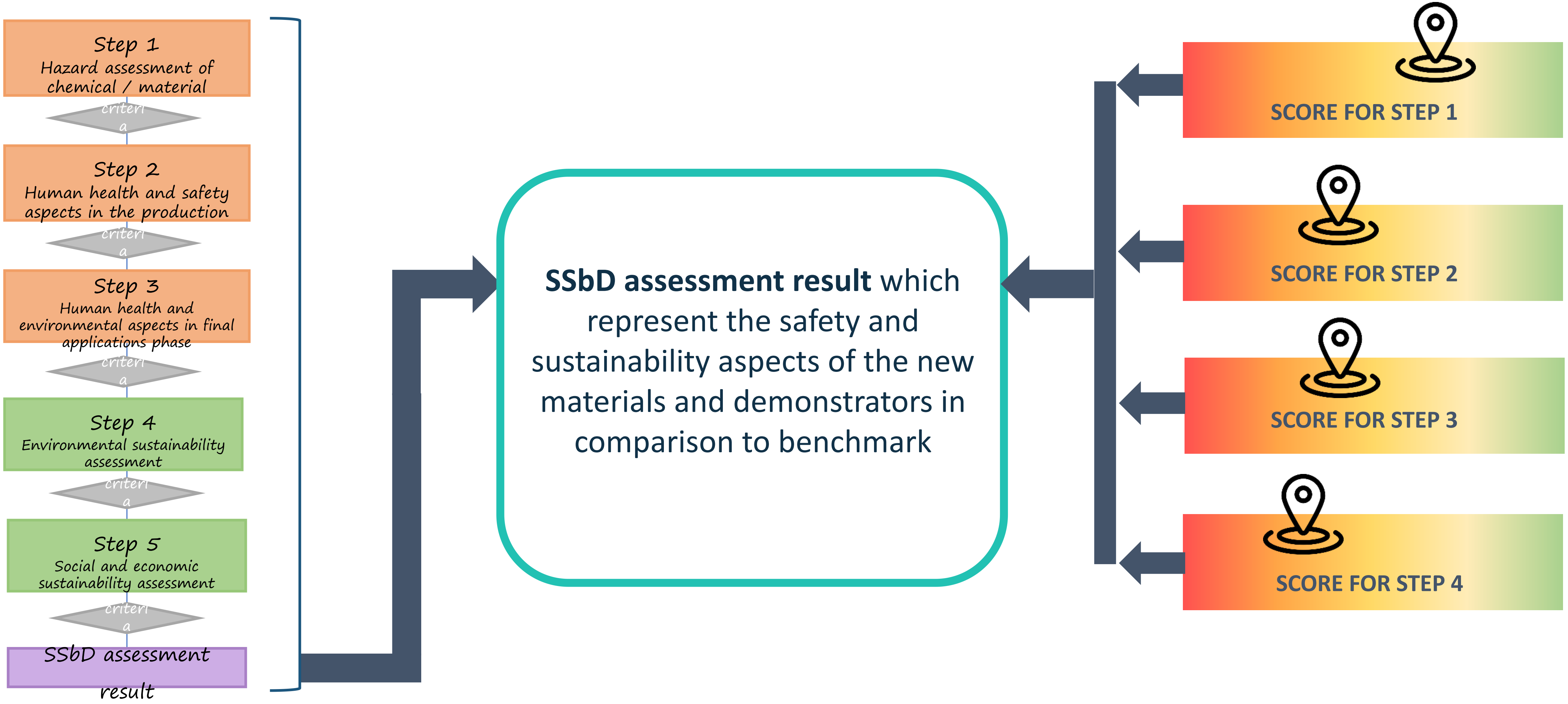

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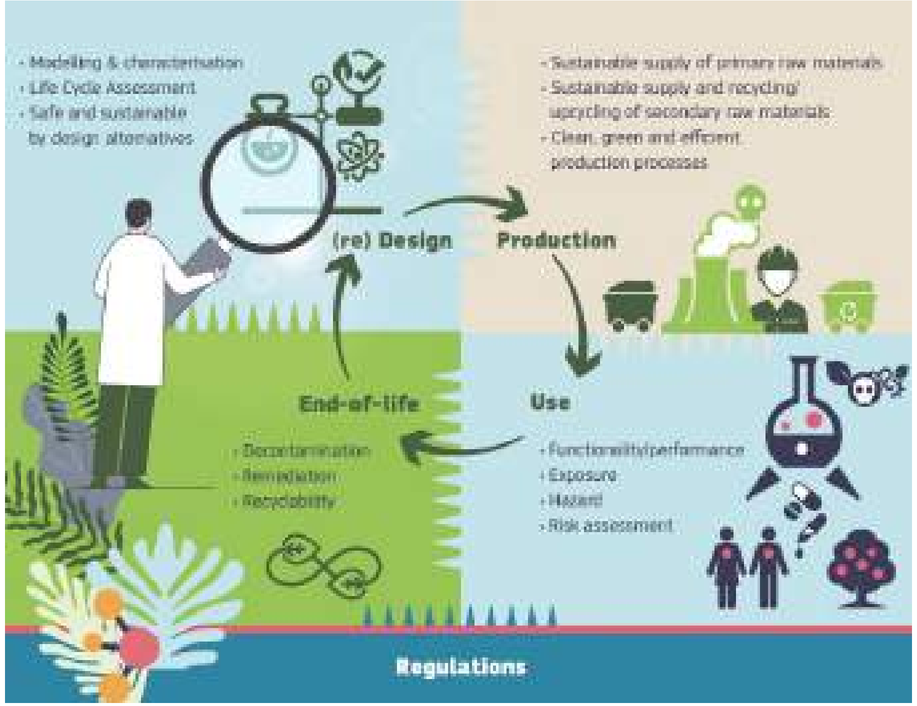

Enhancing bio-based materials

Improving environmental impact

Products from secondary raw materials

PRESERVE

Safety and **Sustainability assessment** of the materials developed under the Project is being carried out in **2 phases**:

- coatings developed in the project
- benchmark products

DONE

- Demonstrators deve

ONGOING

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Thank you
Q&A???

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