The concept of a Circular Economy and the most important measurement points

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NICER PROGRAMME

UK Research and Innovation

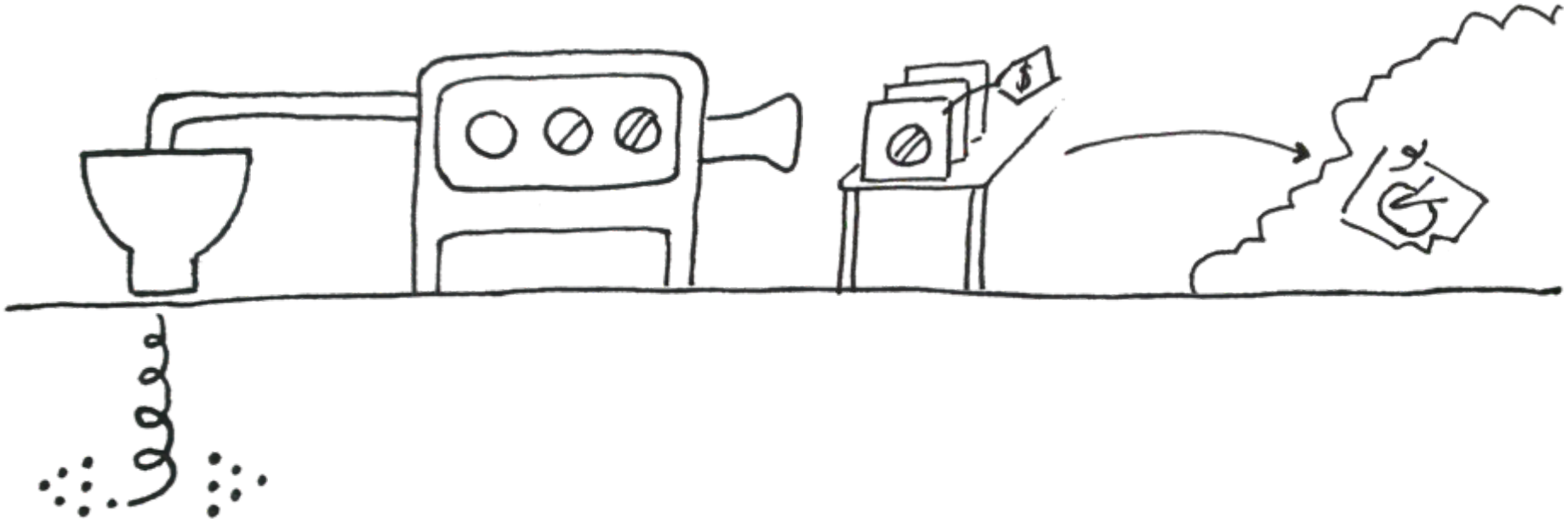
Agenda

Limits to growth of the linear economy

Core concepts and value driver of a Circular Economy

Most important measurement points of a Circular Economy

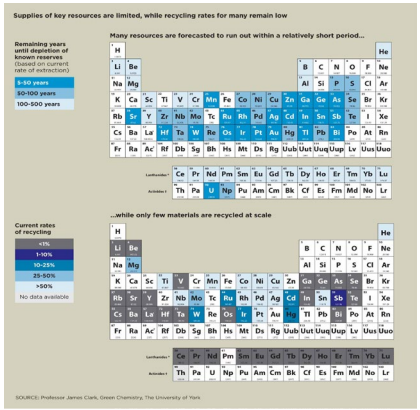
Our starting point – the linear economy



Source: Ellen MacArthur Foundation circular economy team

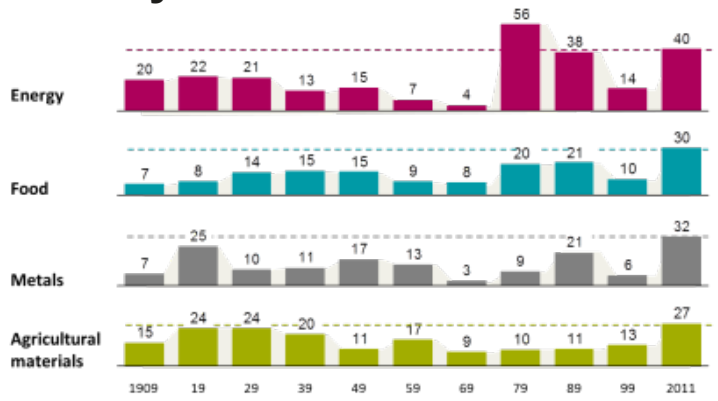
The challenge - symptoms of linear economic distress

Demand / supply inbalance

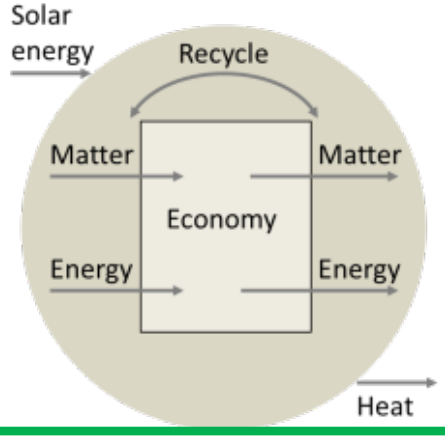


Price

Volatility

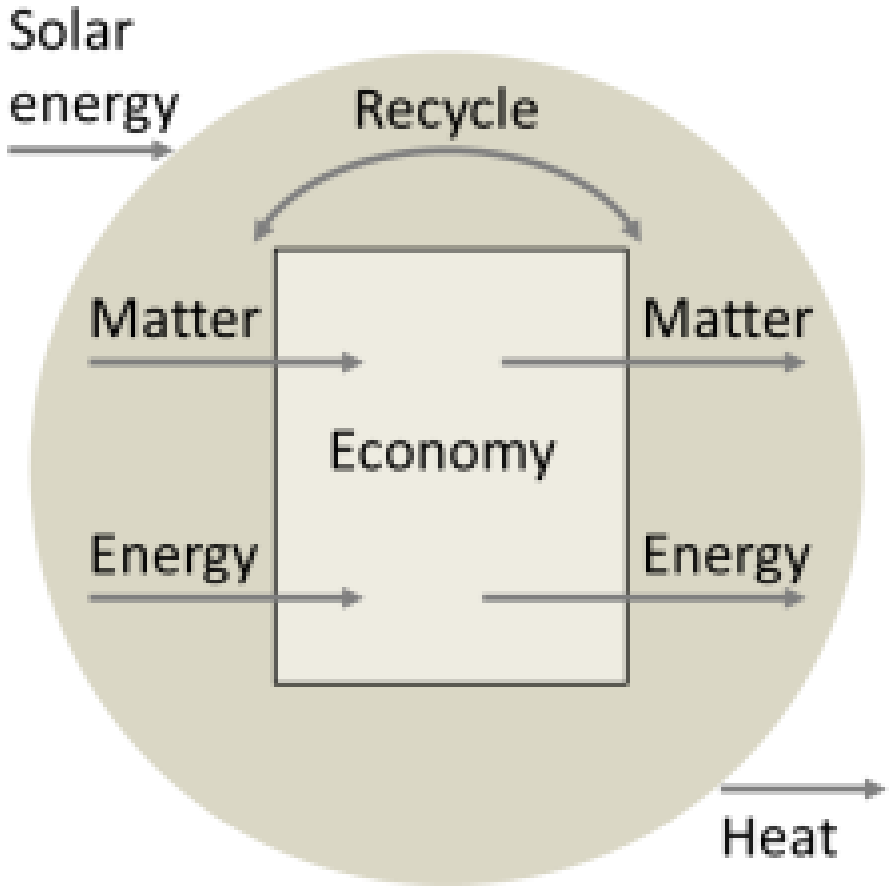


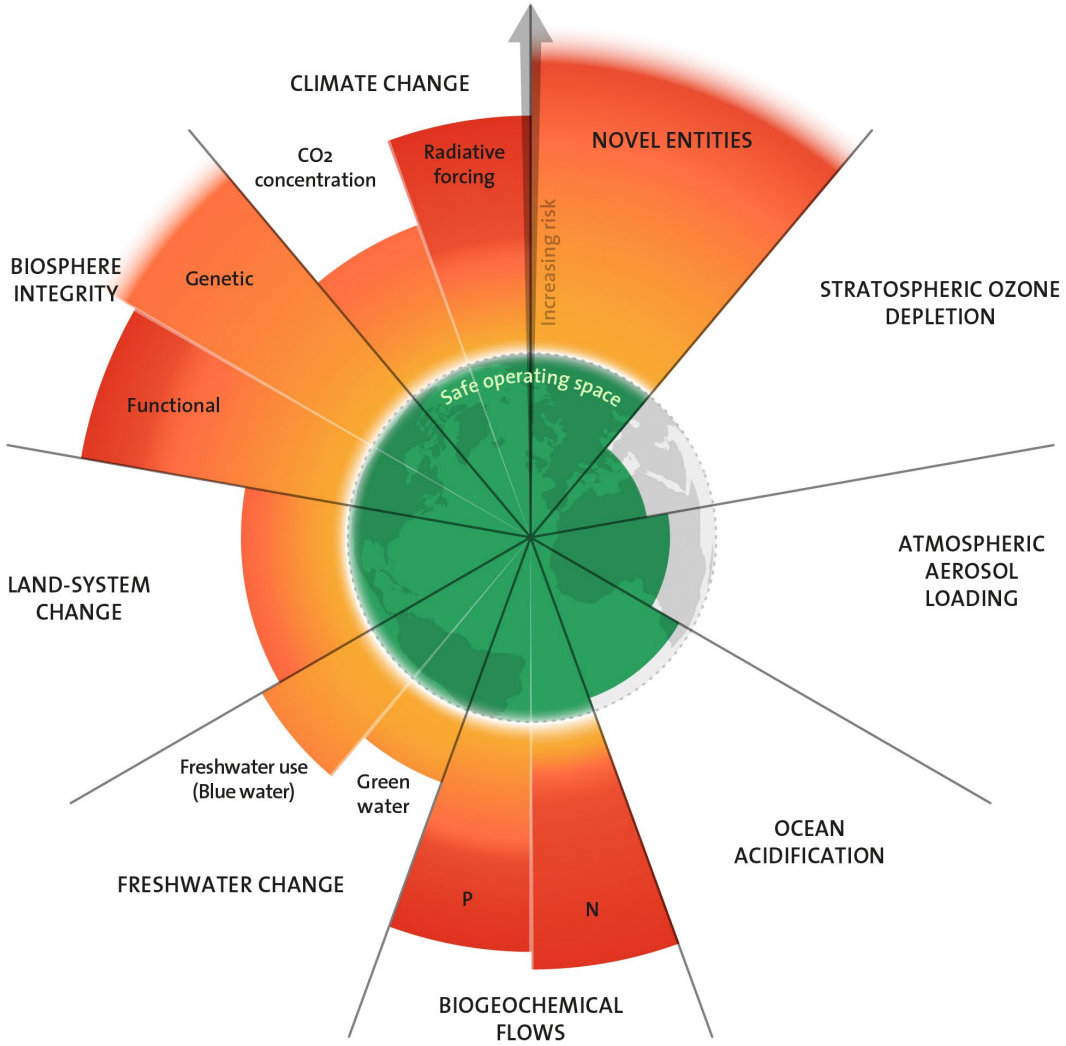
Economic context



Source: Ellen MacArthur Foundation circular economy team

The systemic nexus – resource constraints and carbon neutrality as sink and source constraints for our economic activities





Source: Herman Dayle, Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023 and Steffen et al 2015

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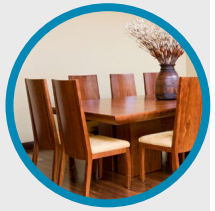
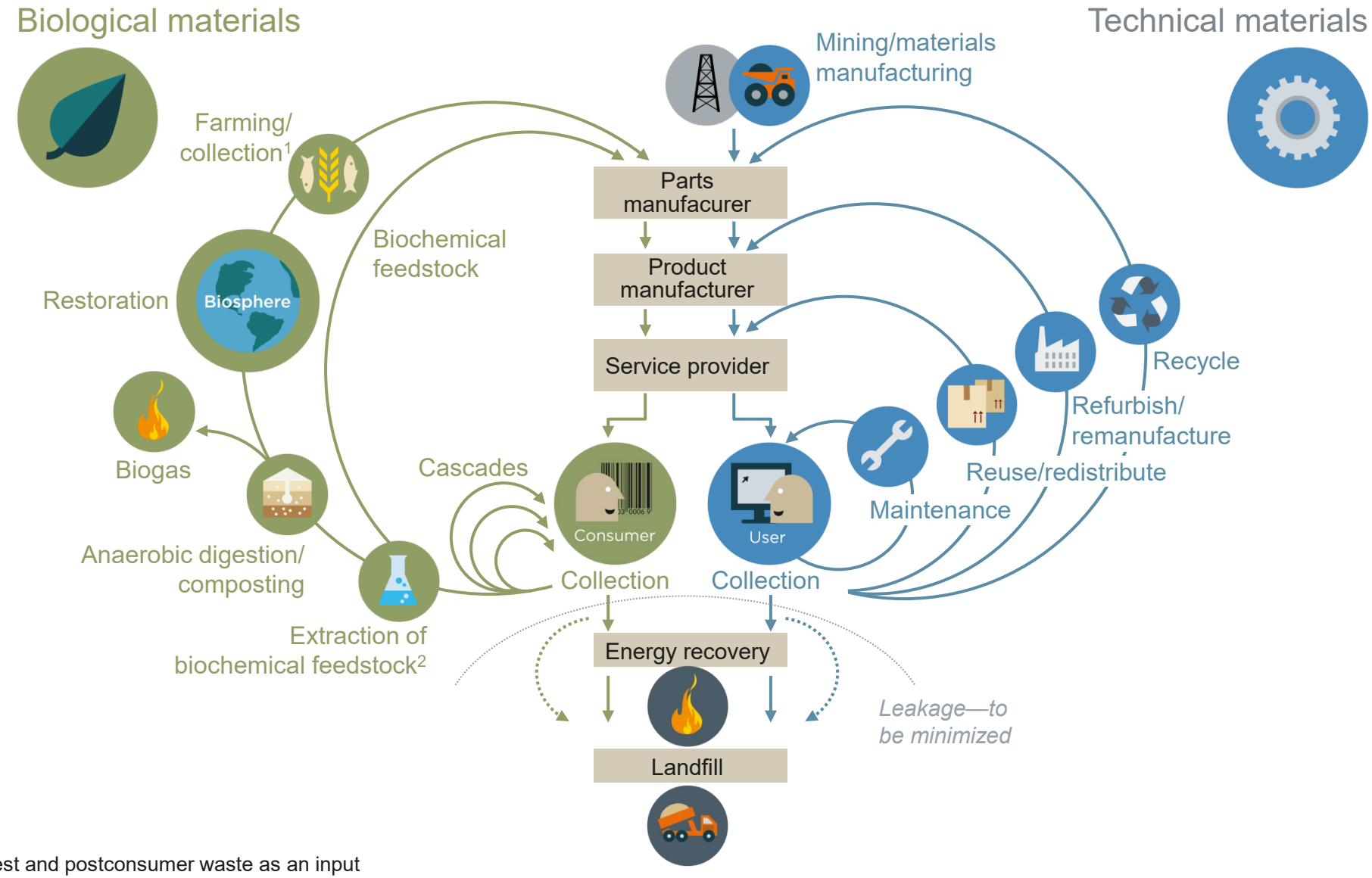
The big, simple idea - go circular

		Carpet	Fridge	Furniture
Linear system	**Resource intensity** Annual average change	+3%	-2%	-2%
	Market growth Annual average	+7%	+8%	+5%
				
Circular system	**Assumed no. of lifecycles**	2	3	4
	Material intensity Reduction potential	**-50%**	**-67%**	**-75%**

SOURCE: German System of Integrated Environmental and Economic Accounting; Euromonitor (2011); Centre for Industrial Studies (2011); Freedonia (2011); Ellen MacArthur Foundation ce team

The circular economy model – flows and stocks



1 Hunting and fishing
2 Can take both postharvest and postconsumer waste as an input

SOURCE: Ellen MacArthur Foundation circular economy team drawing from Braungart & McDonough and Cradle to Cradle (C2C)

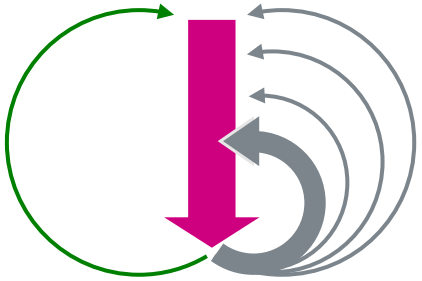
Core exam questions – the why and how

1. What are the core circular economic value drivers?
2. How does it work at micro to meso systems level
3. What are winning strategies and policy interventions for going circular?

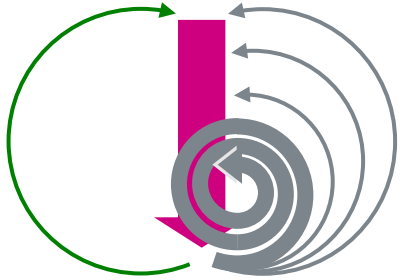
1 Economic value drivers – typical levers

The power of …

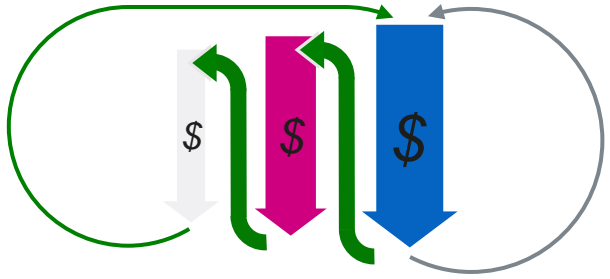
… the inner circle



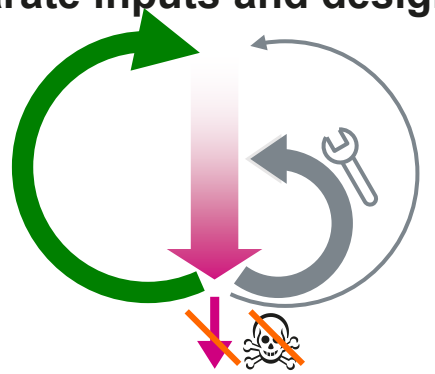
… circling longer



… cascaded use across industries

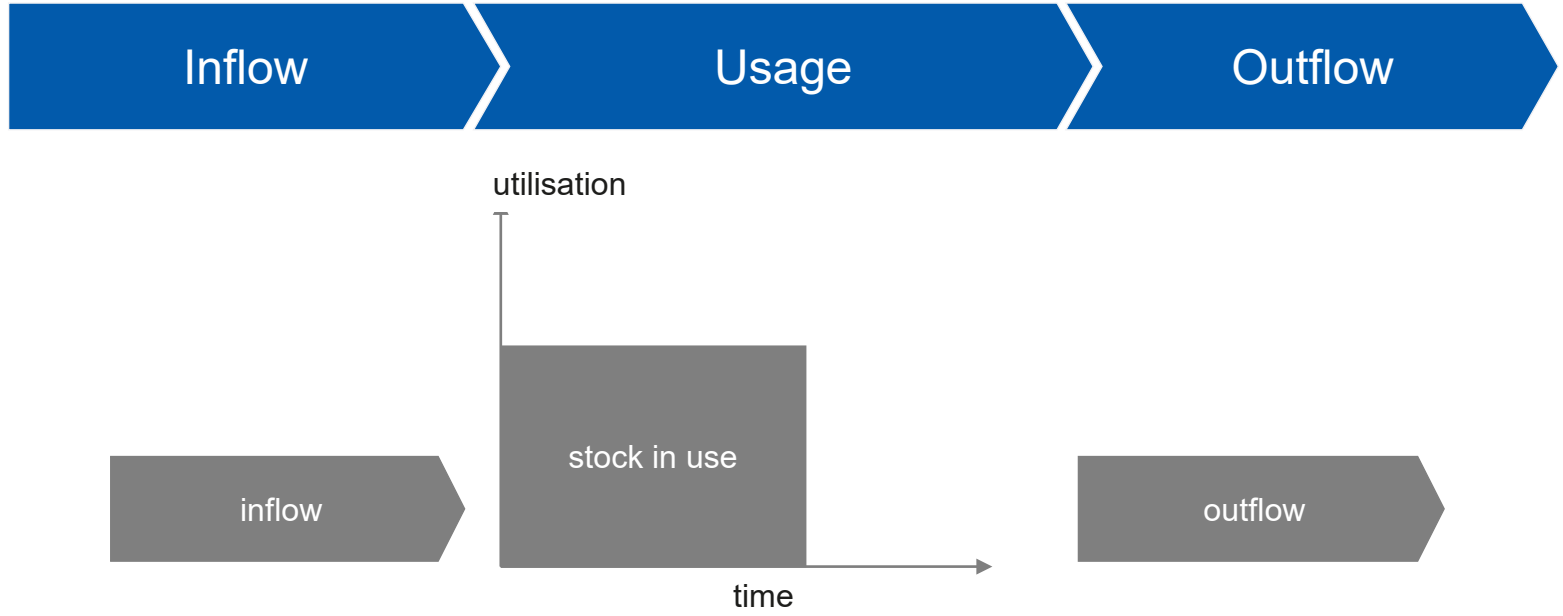


… pure/non-toxic/easier-to-separate inputs and designs

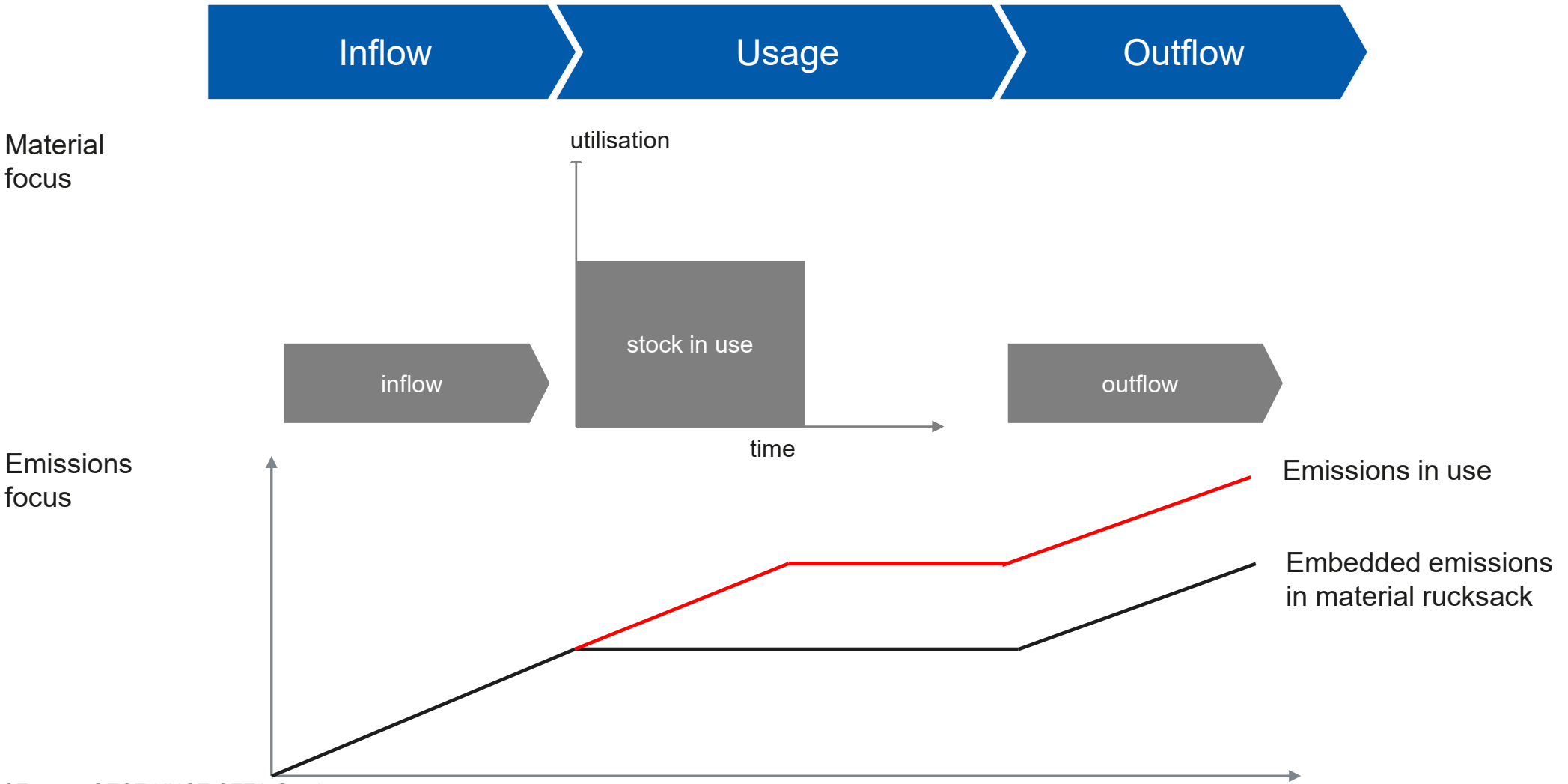


Source: Ellen MacArthur Foundation circular economy team

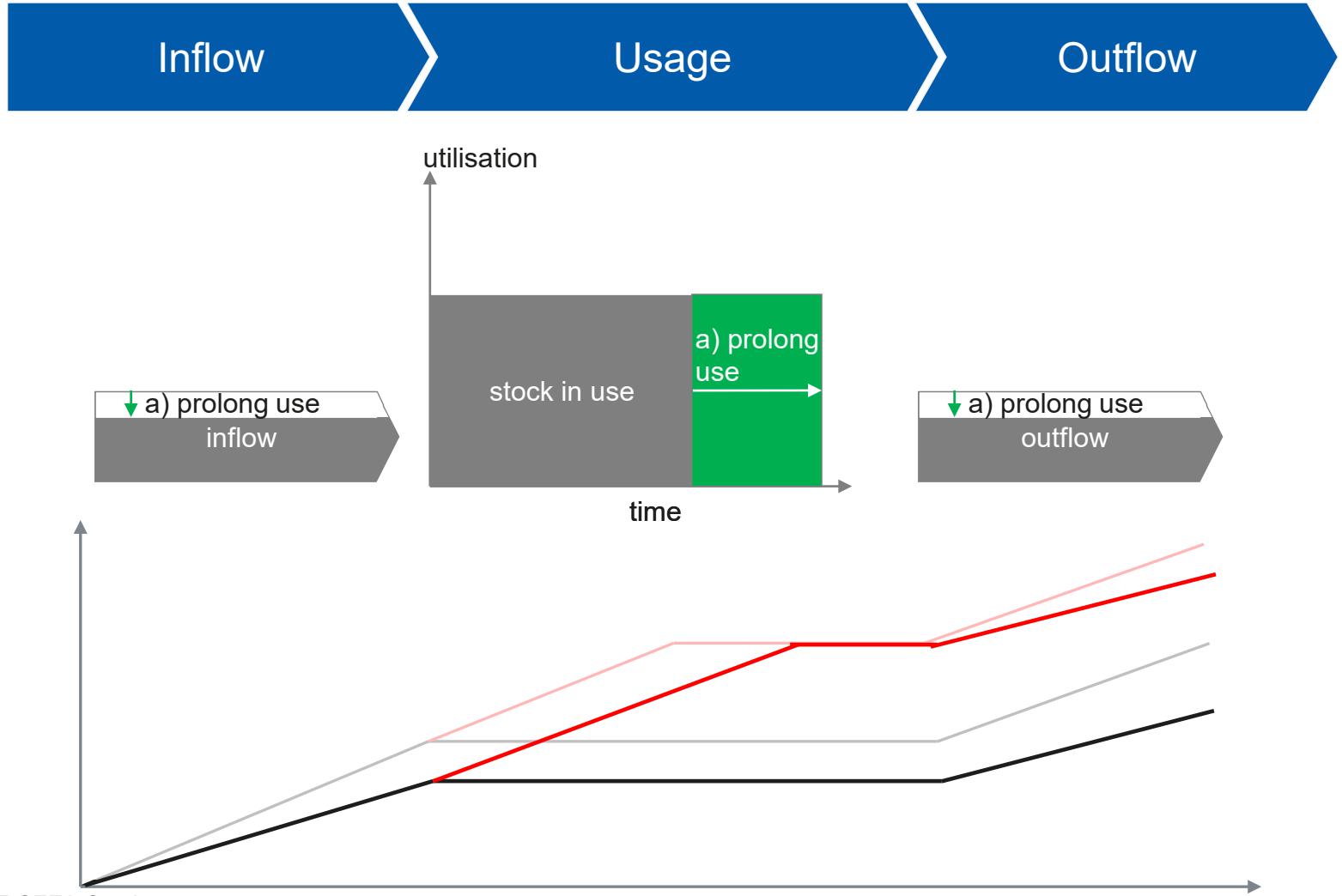
2 The baseline: Circular Economy starts with a look at the (existing) stocks and flows in use



2 The nexus between material stocks and flows and environmental impacts and footprints

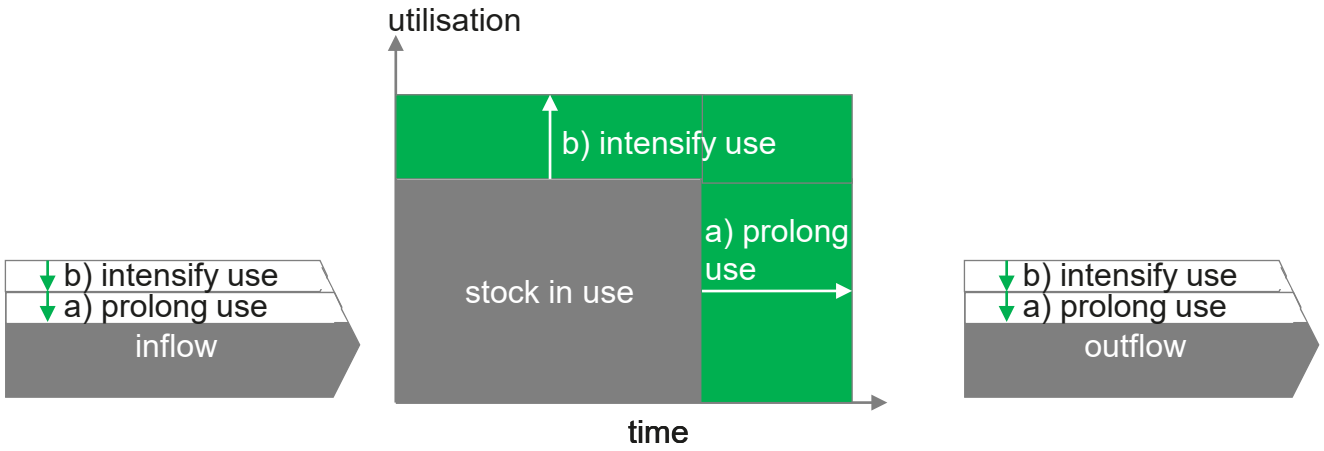


2 Step 1: Prolongation of use reduces need for material in- and outflow on a given stock

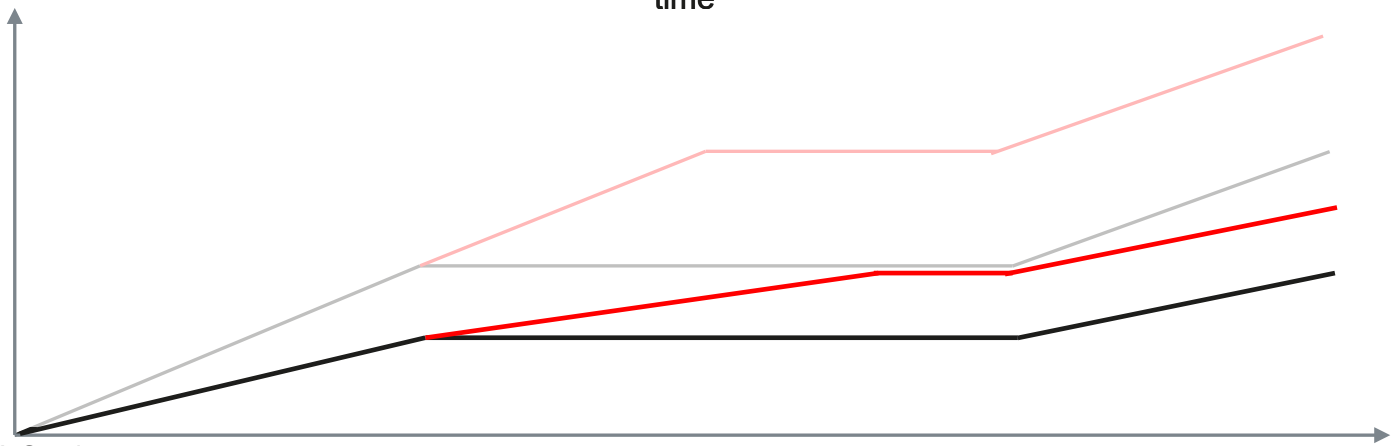


2 Step 2: Intensification of use delivers higher output at lower material intake

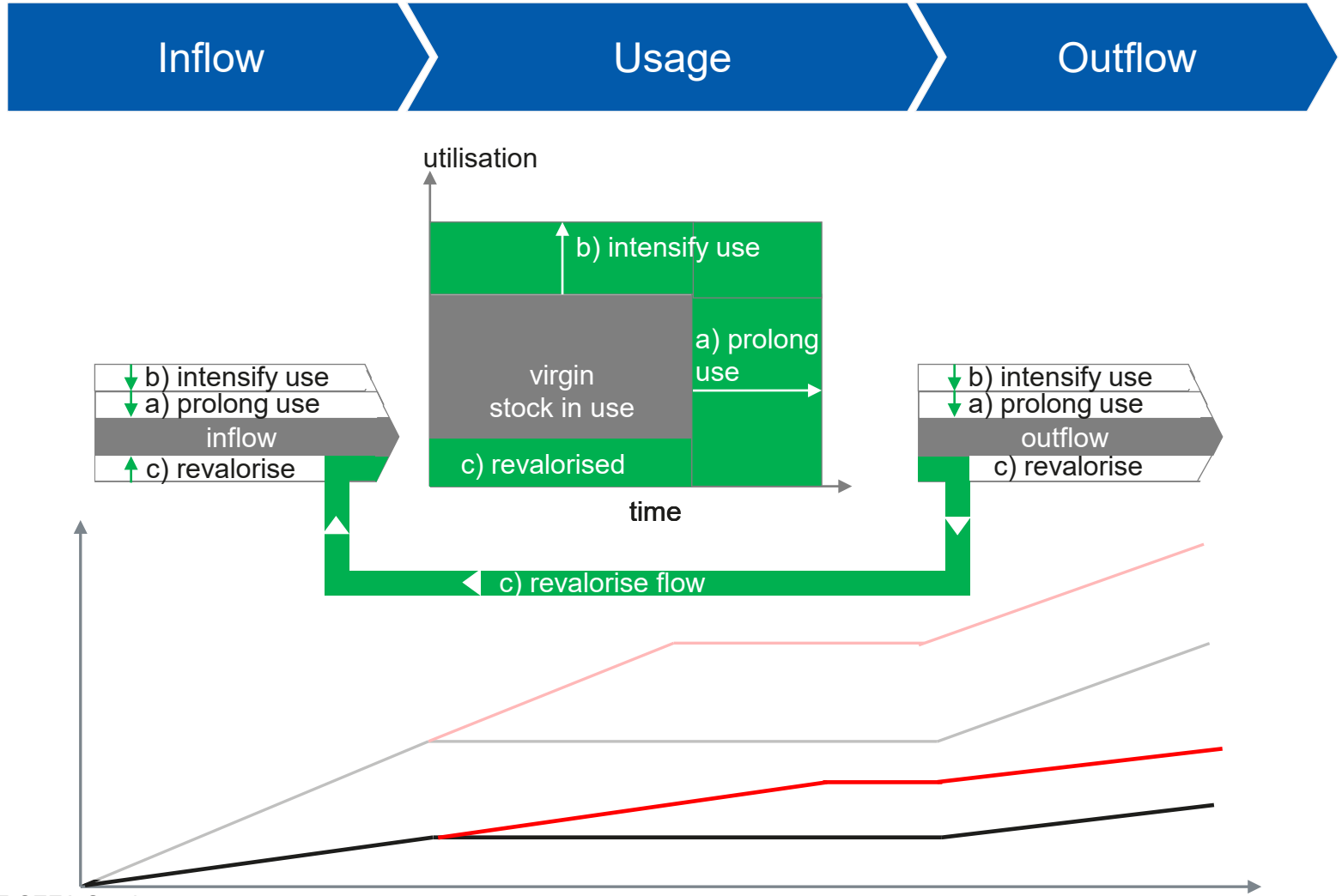
Material focus



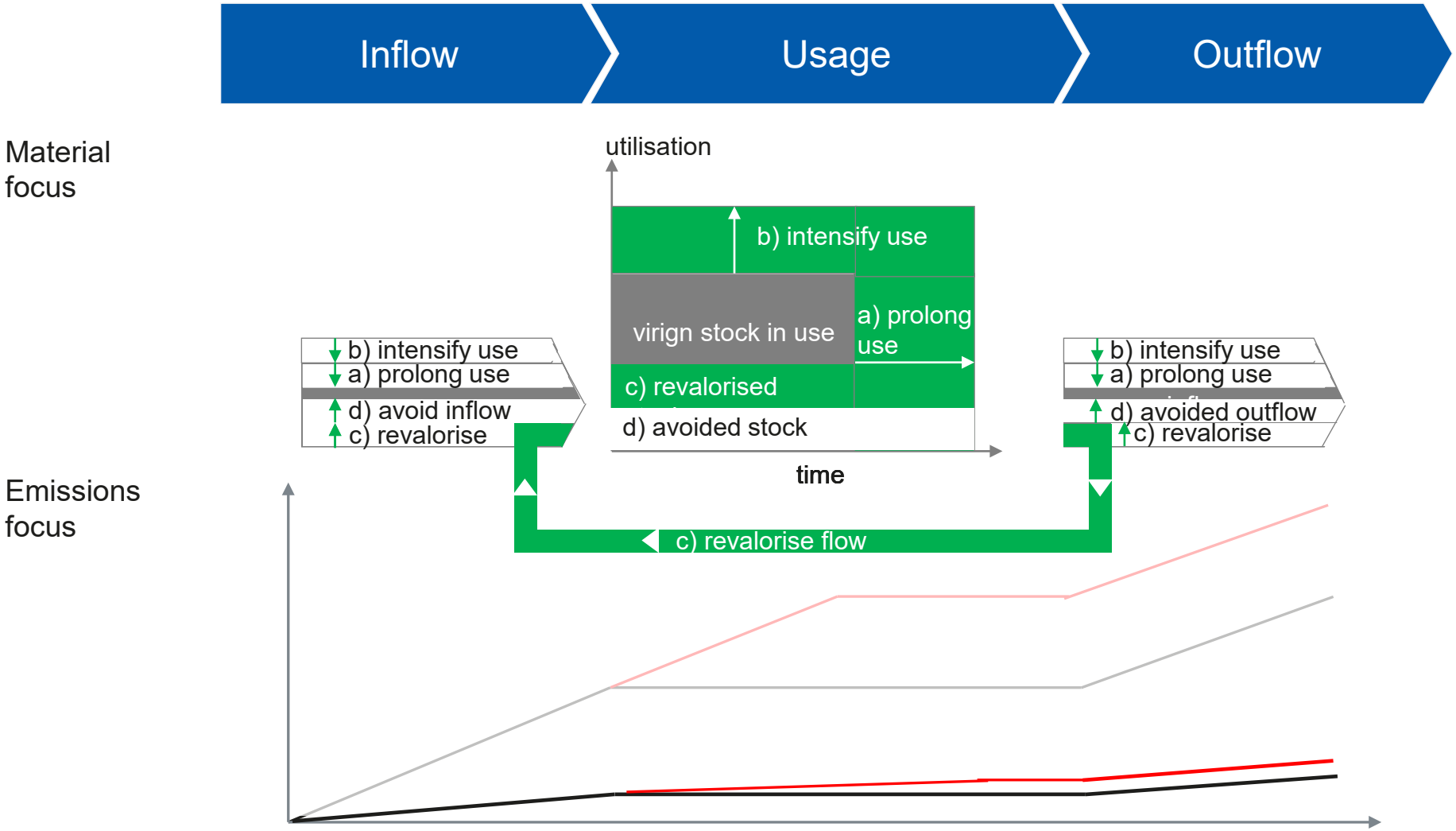
Emissions focus



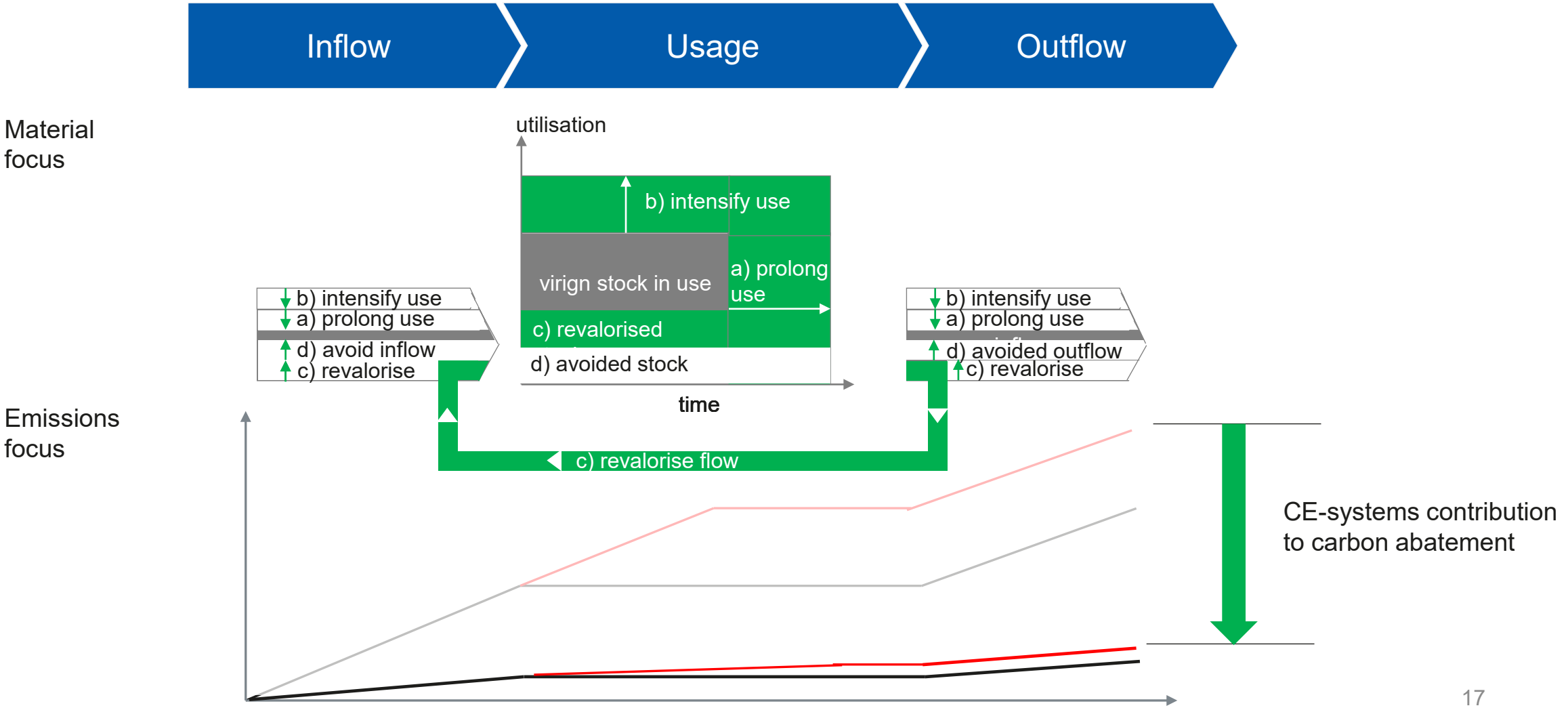
2 Step 3: Adding revalorisation of end-of-use flows further decreases the need for material intake and landfill



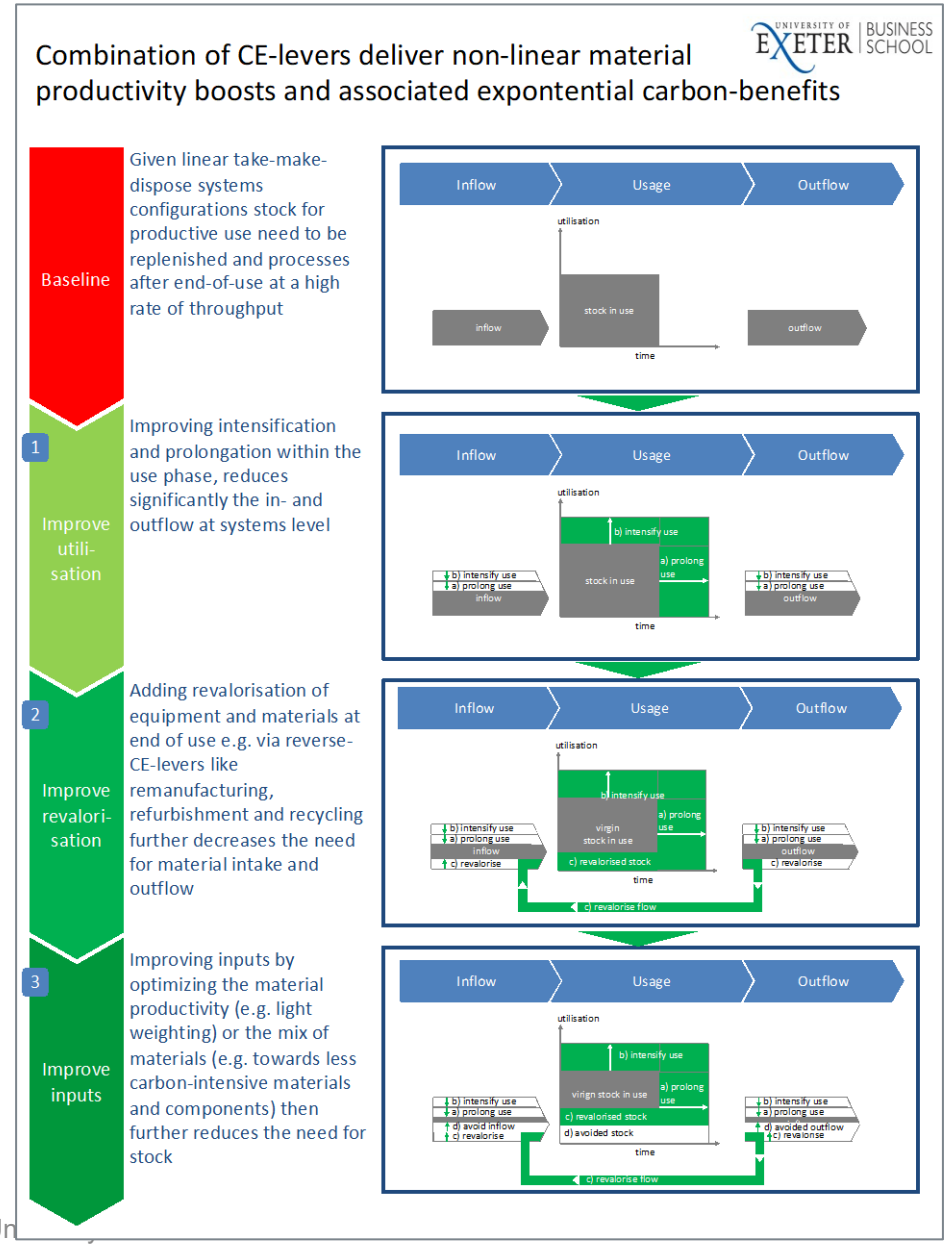
2 Step 4: Improving inflow, smart material-choices and sourcing can further improve resource productivity and environmental performance



2 Compound effect of core CE-levers can deliver non-linear value creation and environmental abatement potential



3 Winning strategies and CE-levers focus on systemic decoupling



Typical winning strategies, CE-Interventions and policy instruments

a. Product life extension: Consumer rights and education, Extended warranty and burden of proof, right to repair, durability labels, eco-designs, …

b. Intensify use: product-as-a-service models, sharing business models, community provided services, ….

c. Revalorise: Take-back-schemes, extended producer responsibility schemes, 9R-toolset, improved collection and separation technologies, optimized gate-pricing to minimize leakage, improved policing of waste and environmental protection, post-use material marketplaces, simplified trade regulations, …

d. Optimize inflow: eco-design regulation, incentives to minimize material proliferation and BOM complexities, improved material choices, tagging and tracking, dematerialisation, …

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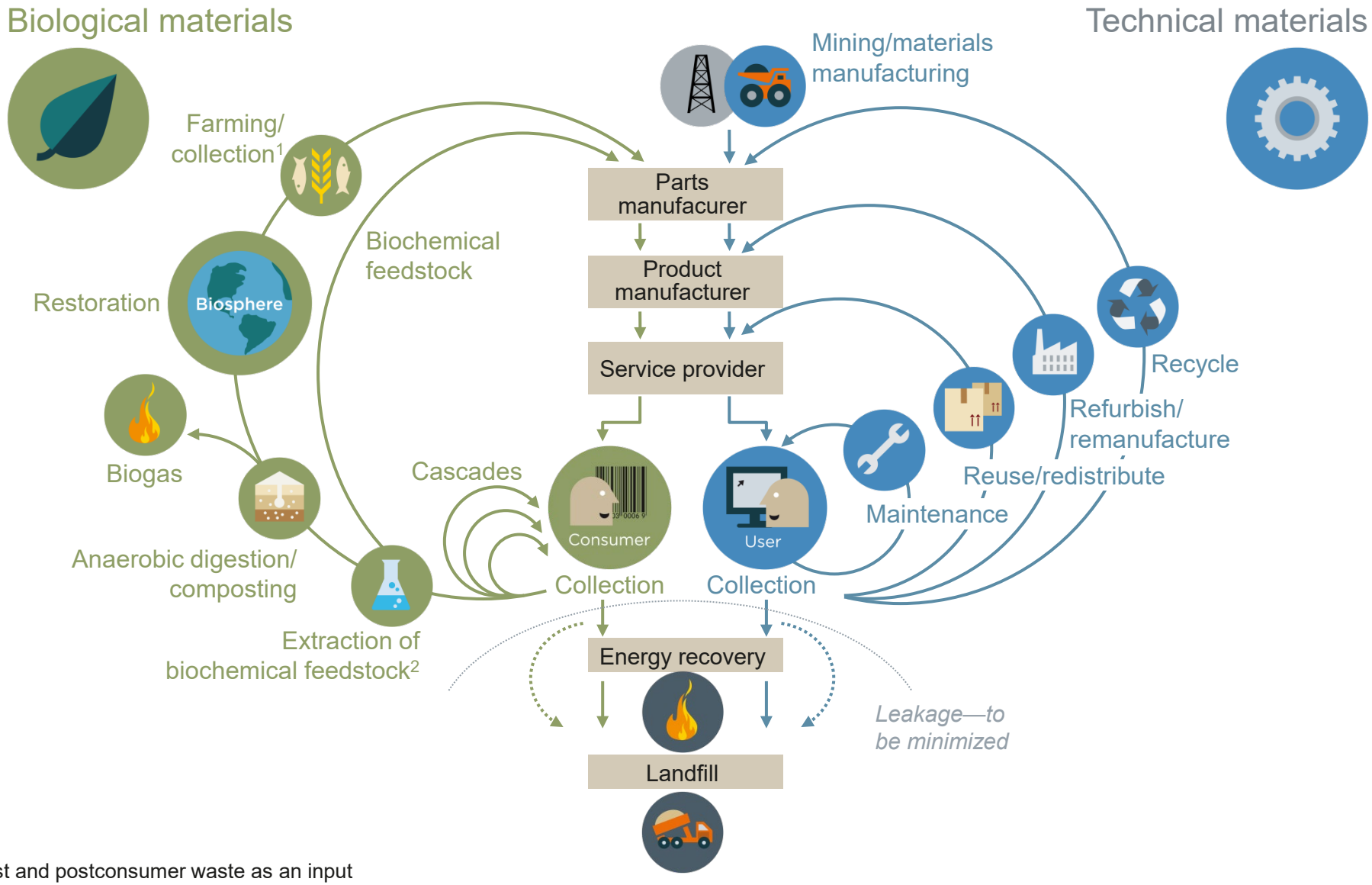


1 Hunting and fishing
2 Can take both postharvest and postconsumer waste as an input

SOURCE: Ellen MacArthur Foundation circular economy team drawing from Braungart & McDonough and Cradle to Cradle (C2C)

CE-interventions can take place at very different levels of granularity in terms of scope and scale

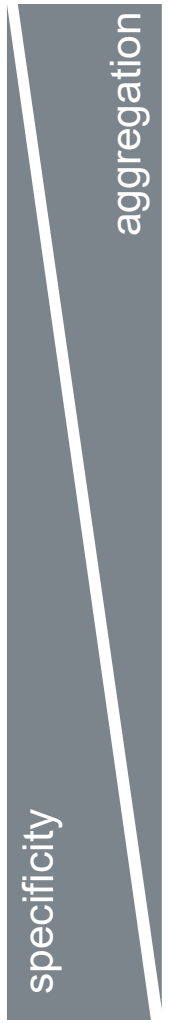
- global strategies
- Explicit modelling for trade implications
- Planetary boundries

- Complex systems interaction
- Input for regional/national sector strategies

- Sub-system wide cross-actor, cross-functional CE-configurations
- Detection and quantification of trade-offs across value chains and embedded externalities

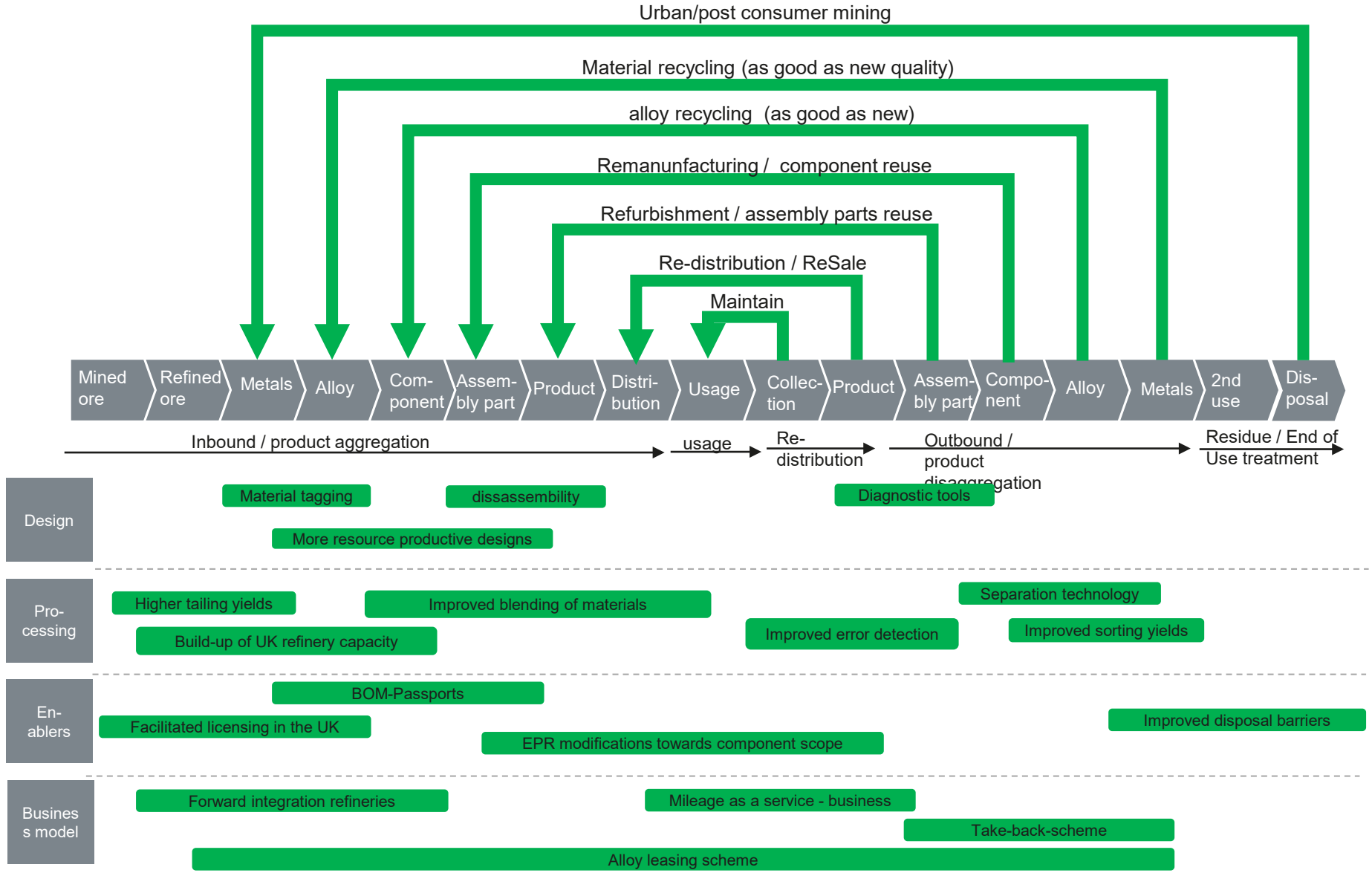
- Technical and business model innovation
- Reconfiguration of trade-offs
- Costing embedded externalities into decision making of corporate actors

- Actual physical flows of (signature) materials, components and products
- LCA and MFA integration



SOURCE: Returnity Partners Research

Shifting a system towards higher degrees of circularity requires often the implementation of levers across building blocks and value chains



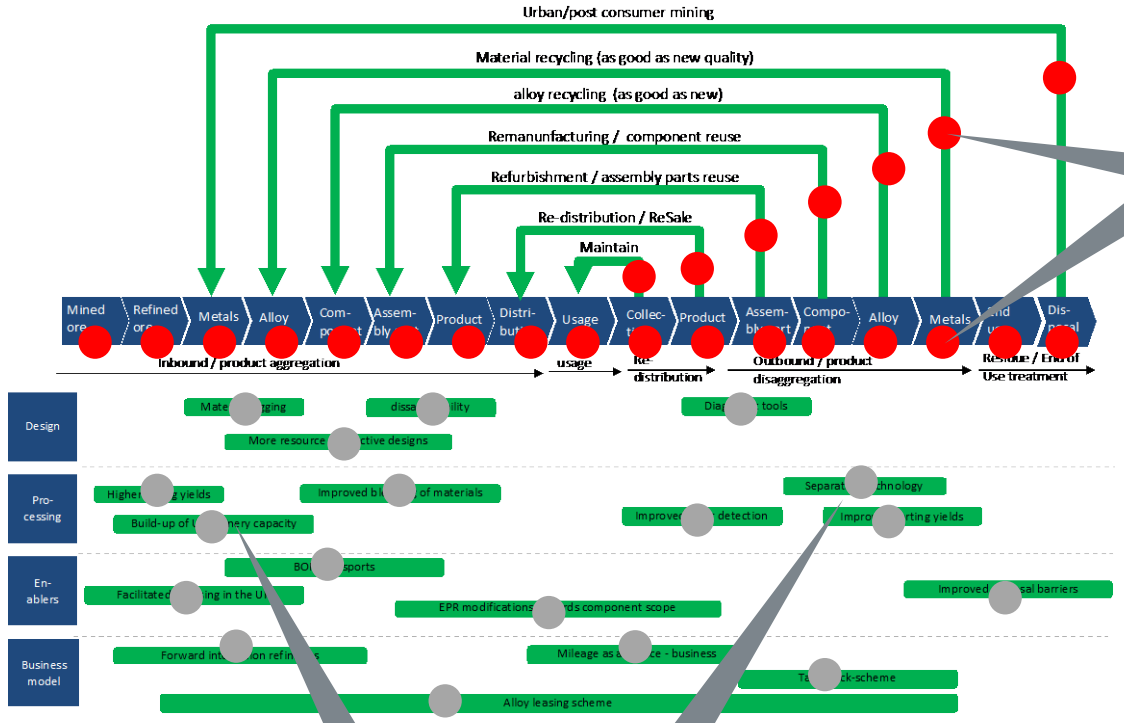
KPI-based monitoring of inputs and outputs could substantially improve impact tracking and programme steering

Output-measuring points

input-measuring points

System performance (output)

Program m performance (inputs)



System performance measurements (outputs)

- **Shifts in quality and quantity in bio-physical resource flows** (e.g. share of remanufactured products) for each major revalorization option
- **Improvements in resource productivity** (e.g. More miles per EV motor)
- **Improvements to local economy** and social aspects (e.g. job creation)
- **Improvements to externalities** (e.g. emissions, pollutants)

Programm performance measurements (inputs)

- Tracking of endproducts and milestones for each CE-intervention
- Measuring classical KPIs for effective and efficient delivery of CE-interventions
- Breaking down of contributions to involved actors along the value chain
- Derivation of lever effectiveness over time by measuring input/output ratios

Measuring points for CE – the bare bone essentials

1. **From** (linear) **to** (more circular) focused
   - Measuring progress over time as CE is (most often) a brownfield transformation
   - Measuring the shift in the end-of-use revalorization pathways over time
   - Need to not only observe but to explore (currently non-existing pathways at scale)

2. **Resource productivity focused** at the the point of use
   - Measuring the overall impact of decoupling utility from material input
   - Measuring the impact on upstream and downstream material metabolisms

3. **Benefits focused** along the value chain
   - At firm and economic actor level as prerequisite for aggregation into sectors and national accounts
   - Desired (and potentially unintended) further consequences, esp. in wider "ESG-terms" leveraging SEEA-approaches

4. **Implementation focused**
   - Measuring progress of required CE-interventions
   - Measuring progress of critical enablers outside own area of influence

My personal perspective

Nothing is impossible, particularly if it is inevitable

Herman Mulder, Chairman of the Global Reporting Initiative

THANK YOU

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